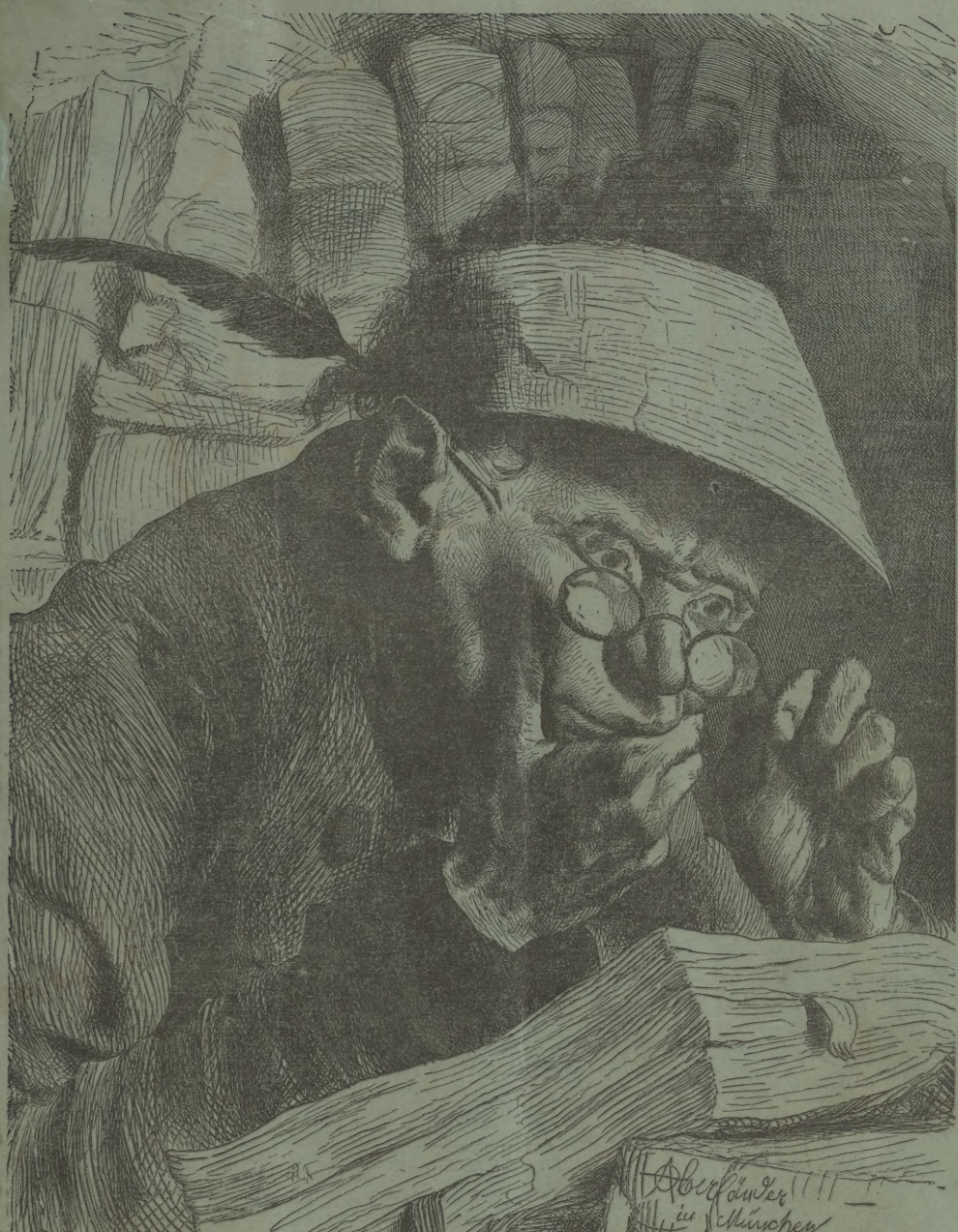
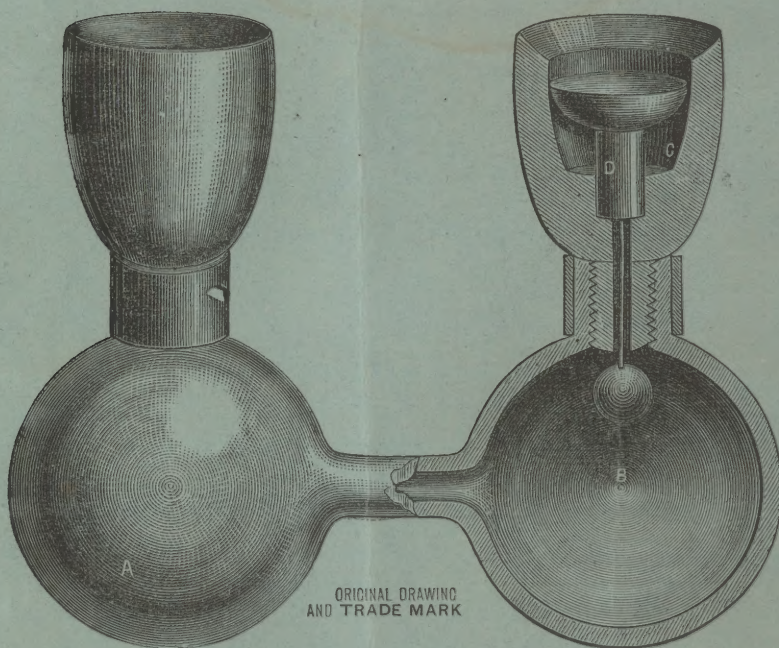
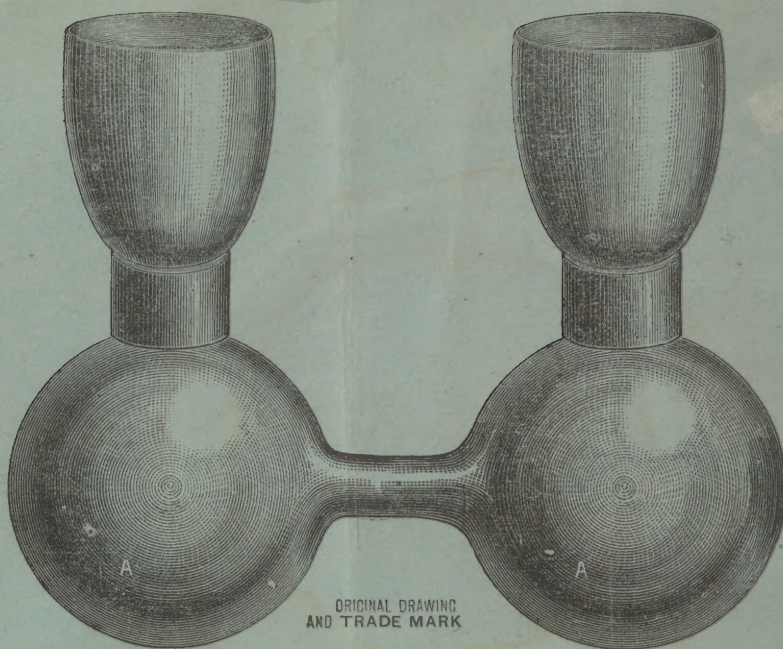


No. 5



PHYSIOLOGY OF THE EYE
AND
HISTORY OF SIGHT-RESTORING INVENTIONS.

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TEST TYPE.

Any one with Normal Eyes should be able to read this book fluently in the most natural manner without spectacles. If you cannot, then the longer you neglect your eyes the more you will finally regret it.

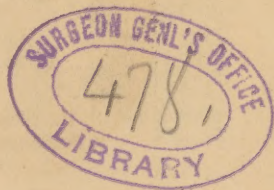
PHYSIOLOGY OF THE EYE,

AND

HISTORY OF SIGHT-RESTORING INVENTIONS, FROM 1851 TO 1873.

OF PRACTICAL USE TO EVERYBODY.

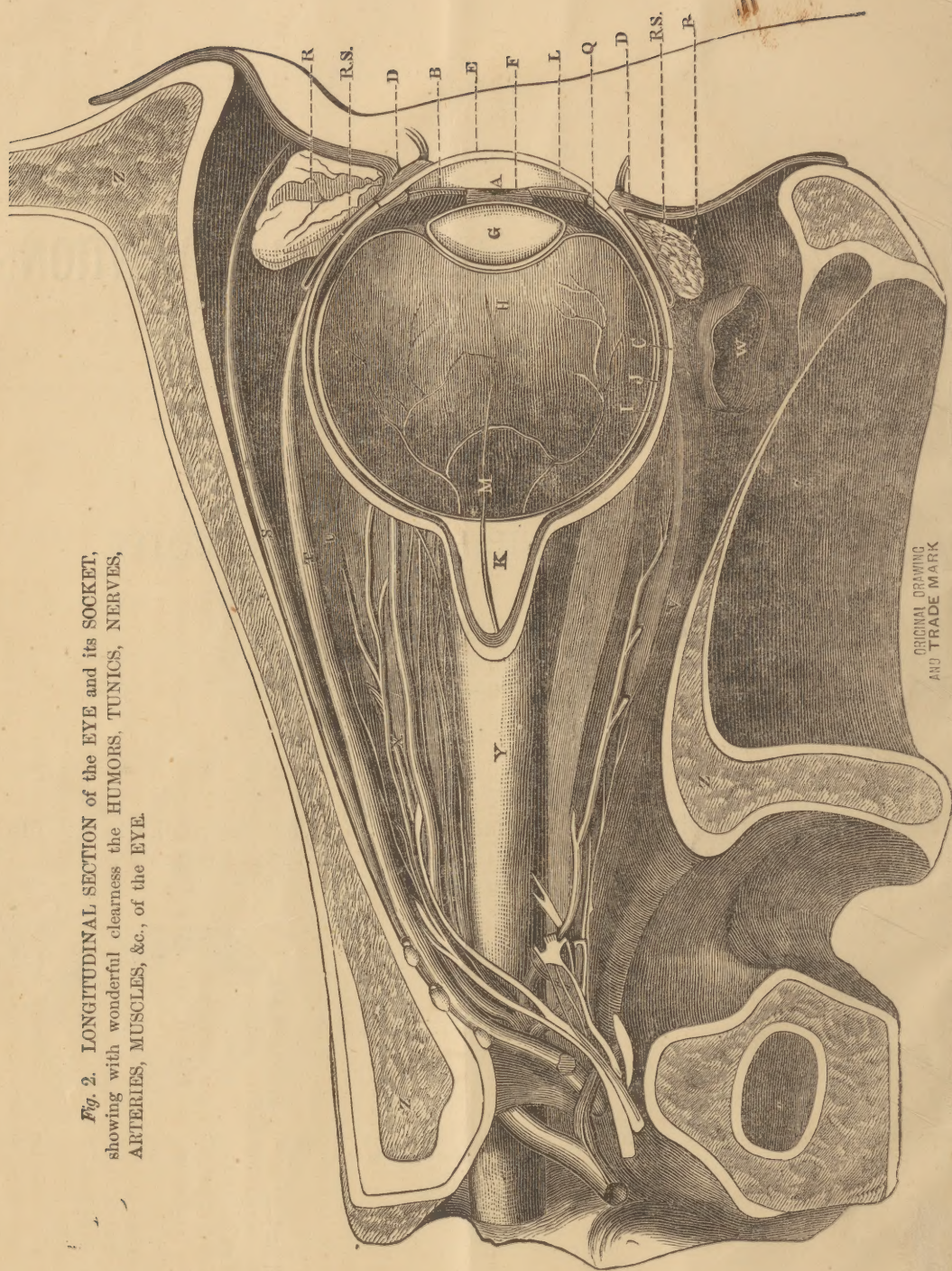
THE ENGRAVINGS IN THIS WORK ARE ORIGINAL. THEY WERE EXECUTED AT GREAT
COST, AND ARE USED EITHER SINGLY OR TOGETHER AS
"TRADE MARKS."



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1873.

Fig. 2. LONGITUDINAL SECTION of the EYE and its SOCKET, showing with wonderful clearness the HUMORS, TUNICS, NERVES, ARTERIES, MUSCLES, &c., of the EYE.



ORIGINAL DRAWING
AND TRADE MARK

Fig. 3.

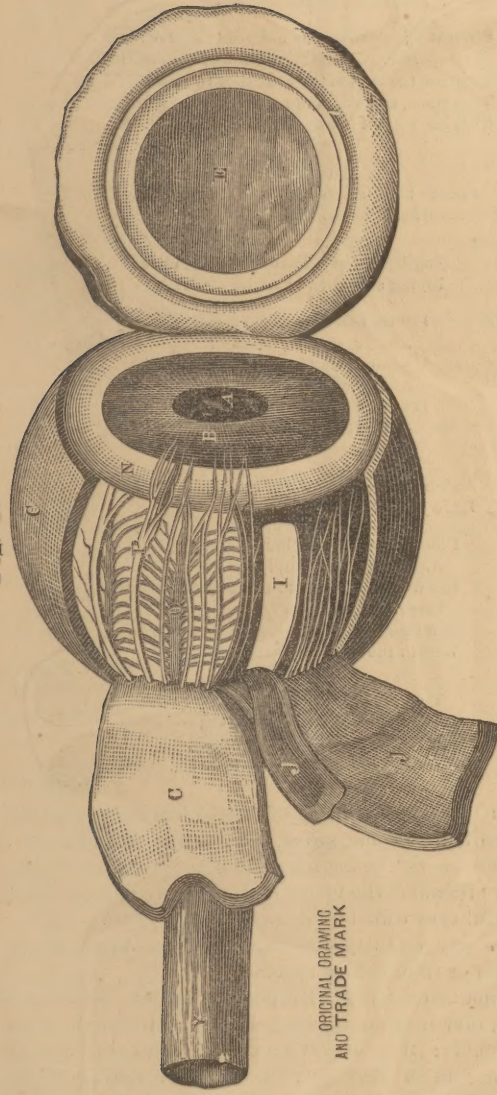


Fig. 3.—Eyeball removed from its socket, and partially Dissected, so as to show the Coats, Muscles, Nerves, etc., of the Eye. [Enlarged.]

THE HUMAN EYE,

As delineated by C. Stephens.

EXPLANATION.—The following letters of reference apply to each figure :

- A.* The Pupil, a circular opening in the Iris, capable of being contracted or enlarged according to the amount and intensity of light.
- B.* The Iris, a flat circular membrane or ring of a grey, blue or black color, forming the anterior and posterior chambers of the Eye.
- C.* The Sclerotic Coat, a tough, white membrane, to which the muscles for moving the Eye-ball are attached.
- D.* The EYELIDS, containing the tarsal fibro cartilages.
- E.* The CORNEA, composed of tough, transparent laminae, forming the front of the Eye—the first surface whence the rays of light are refracted.
- F.* The Aqueous Humor, contained in a delicate membrane, filling the space from the Cornea to the Crystalline Lens.

- G.* The CRYSTALLINE LENS and CAPSULE, the principal refracting medium of the Eye.
- H.* The VITREOUS HUMOR (contained in the Hyaloid membrane), a jelly-like substance, filling the body of the Eye—perfectly transparent.
- I.* The RETINA, being an expansion of the Optic Nerve, on which images of external objects are projected.
- J.* The CHOROID COAT, a delicate membrane lining the Sclerotica, covered on its inner surface with a black substance (pigmentum nigrum,) contiguous to the Retina.
- K.* The great nerve of the sight, the OPTIC NERVE.
- L.* CANAL OF PETIT.
- M.* CENTRAL ARTERY of the OPTIC NERVE.
- N.* CILIARY CIRCLE (muscle of accommodation).
- O.* CILIARY NERVES, running forward to supply the Iris, B

P. VASA VORTICOSA.

Q. The CILIARY PROCESSES.

R. TUNICA CONJUNCTIVA.

RS. TUNICA CONJUNCTIVA, collapsed, as when the Eye is closed.

S. ELEVATOR MUSCLE of the EYELID.

T. ELEVATOR MUSCLE of the EYE.

U. SUPERIOR OBLIQUE MUSCLE.

V. DEPRESSOR MUSCLE of the EYE.

W. Section of OBLIQUE INFERIOR MUSCLE.

X. NERVES and ARTERIES.

Y. TUBE conveying the OPTIC NERVE to the Brain.

Z. Bone forming the Socket of the Orbit of the Eye.

PHYSIOLOGY OF THE EYE.

OF PRACTICAL USE TO EVERYBODY.

LANGUAGE OF THE EYES.



HE eye is the chief seat of the soul's expression; it shows the very spirit in a visible form.

In every different state of mind, it appears differently:—*joy, brightens and opens it; grief, half closes and drowns it in tears; hatred and anger, flash from it like lightning; love, darts from it in glances, like the orient beam; jealousy and squinting envy, dart their contagious blasts through the eyes; and devotion raises them, or throws them back on the mind, as if the soul were about to take its flight to heaven.*

Eyes do not appear beautiful behind the clearest of glasses, on the contrary, eyes behind spectacles present usually a rather wild and scary look. Spectacles darken the outward skin around the eye, and soon cause the lights of the body to set in darkness. Many cover inflamed sore, diseased and ill looking eyes with glasses, in order to hide them from too close observation.

We neither know or care who first invented the use of spectacles. For seven centuries, inventors, philosophers, and scientific men have taxed their brains to discover some remedy for failing sight, so as to rid themselves of the bother, annoyance, and expense of spectacles.

As early as 1290, Roger Bacon wrote:—"Spectacles are worn in front of the eyes to assist defective vision." In general, the required focal distance of glasses diminishes with the age of the person, as the defect of far-sightedness increases.

The number of inches of focus adapted to the different ages, in the majority of cases are 36 inches for 40 years; 24 for 50; 16 for 60; 12 for 70; 9 for 80; 7 for 90; 6 for 100.

We have unearthed the poets in vain to discover if any one ever saw beauty in an eye covered with glasses?

You are invited in their company for a few moments:—Come in, don't wait at the door.

Her eye (I'm very fond of handsome eyes)
Was large and dark, suppressing half its fire
Until she spoke; then, through its soft disguise,
Flash'd an expression more of pride than ire,
And love than either.

Byron.

Those eyes, those eyes, how full of heaven they are,
When the calm twilight leaves the heaven most holy!
Tell me, sweet eyes, from what divinest star
Did ye drink in your liquid melancholy?
Tell me, beloved eyes!

Bulwer.

Those eyes that were so bright, love,
Have now a dimmer shine;
But what they've lost in light, love,
Is what they gave to mine;
And still those orbs reflect, love,
The beams of former hours,

That ripen'd all my joys, love,
And tinted all my flowers.

Hood.

From woman's eyes this doctrine I derive;
They sparkle, still the right Promethean fire;
They are the books, the arts, the academies,
That show, contain, and nourish all the world,
Else, none at all in aught proves excellent.

Shaks. *Love's Labour.*

His dark, pensive eye,
Speaks the high soul, the thought sublime
That dwells on immortality.

Charlotte Elizabeth.

Thy brown eyes have looks like birds,
Flying straightway to the light.

Miss Barrett.

I never saw an eye so bright,
And yet so soft, as hers;
It sometimes swam in liquid light,
And sometimes swam in tears;
It seem'd a beauty set apart
For softness and for sighs.

Mrs. Welby.

I have sat,
And in the blue depths of her stainless eyes
Have gazed!

Willis.

I look upon the fair blue skies,
And naught but empty air I see;
But when I turn me to thine eyes,
It seemeth unto me
Ten thousand angels spread their wings
Within those little azure rings.

O. W. Holmes.

Those eyes,—among thine elder friends
Perhaps they pass for blue;—
No matter,—if a man can see,
What more have eyes to do?

O. W. Holmes.

You observe they speak of bright black and melting blue, soft, handsome, sweet, pensive and stainless eyes.

Spencer says "he has found nothing on earth to which he dare resemble the image of the goodly light of those powerful eyes which lightened his dark spirit."

Does any one suppose that poets see these things through or from behind spectacles?

Do not be deceived! Spectacles disfigure the countenance, they may do for diseased eyes until again made presentable; but every intelligent man or woman knowing of a certain remedy for restoring Sight will see to it that BOTHERSOME and unbecoming SPECTACLES are LAID ASIDE, provided they can once more see their friends and books with healthful, youthful, naked eyes.

The rich consider loss of sight about the greatest misfortune. How must it be with the middle and lower classes of society, the greater part of mankind whose existence for want of money, cultivated minds and ability to work, find their existence dark and dreary, solitary and cheerless, a burden to themselves and everybody around them.

THE LIGHT OF THE BODY IS THE EYE.

The bright black eye, the melting blue,
I cannot choose between the two;
But that is dearest all the while,
Which wears for us the sweetest smile.

O. W. H.



HE object of this book is to present to the notice of the public a simple invention for exercising the eye by means of which the decay of sight may be prevented, and when decayed, may be restored to its original power.

It is a fact well known to all, that as man advances in years, the organs of vision become impaired. Dr. Kitchenor says, with truth, that so universal is this failure of sight, that between the ages of forty and fifty years, a large average of the human race are obliged to have recourse to spectacles, to aid the failing vision.

It is almost unnecessary to say, that this defect of sight is first discovered by a mistiness in near objects, whilst those which are distant are discovered with the usual ease or perhaps appear to be presented with more than usual vividness.

The evil here spoken of—as onerous in its burden as it is common to our nature—has long engaged the attention of the scientific; but the efforts of science have not, hitherto, been able to reach the root of the evil; and that, because the attention has not been directed to the cause.

Lotions, salves, and washes have been applied, which, in some cases, have afforded to the sufferers a temporary benefit, but in the end all have been obliged to resort to the use of spectacles. These are not only exceedingly *inconvenient*, but in most cases have increased the difficulty which it was hoped their use would remedy. It is well known to all who have been unfortunate enough to resort to their use, that they require to be changed, after having been used a year or two, for others of greater power; thus adding to their inconvenience a great expense.

Having already inquired into the anatomy and physiology of the eye, it is sufficient, now, to point out the cause, showing to the afflicted a remedy, and to those who have not arrived at this deplorable state, a means of preventing its occurrence.

Upon the cause of this decay of vision, all learned men agree, viz., in assigning it to a gradual and imperceptible flattening of the cornea of the eye. This flattening of the cornea is accounted for thus:—*When the humors which support the cornea cease to flow in their usual force and quantity, the cornea becomes flatter than before; and, in consequence of this flattening, the light passing through the eye is not sufficiently refracted, and does not converge on the retina, but would do so at some distance beyond. The consequence is, a confused picture is painted on the retina, and objects appear indistinct and dim.*

On this subject we will quote the opinion of William Mackenzie, Lecturer on the Eye, in the University of Glasgow, and Surgeon to the Glasgow Eye Infirmary; which opinion is set forth in his *Practical Treatise on the Eye*, as follows:

“There can be no doubt that deficient refraction is the proximate cause of presbyopia (far-sightedness).

“With regard to the efficient cause of flatness of the cornea from diminution in the quantity of the aqueous and vitreous humors, is the one most commonly mentioned; this diminution being supposed to depend on the impeded manner in which the functions of secretion are performed in advanced life.”

The remedy is to be found in a simple instrument, called the Duplex Eye Sight Restorer, used for exercising the eye and restoring a healthful flow of the aqueous and vitreous humors, the effect of which is to add vitality and strength by increasing the circulation simultaneously in both eyes under the same atmospheric pressure or suction, and bringing the sight to the natural focus by restoring the diminished convexity of the cornea. This wonderful effect is produced without pain or the possibility of injury to the eye.

IT CANNOT INJURE THE EYE.

No pain or discomfort need be produced by the use of the Duplex Eye Sight Restorer, nor can it in any way injure that most perfect natural optical instrument which enables us to see the beautiful things God has strewn in our pathway. The finger carelessly brushed across the ball of the eye, or a little grain of sand, or any other irritating substance, if it enter the eye will scratch, redden, and inflame it, but it will bear any amount of pressure without injury, for it is protected by membranes as tough as leather. If you would like to test its toughness, experiment upon the eye of an animal, which you can easily get of any butcher. You will then readily see that the pressure, necessary to restore fullness to the face of the eye, can be made without the least danger, by closing the lids, and thereby simply protecting the sclerotic membrane from abrasion.

The Duplex Eye-Sight Restorer is a perfectly harmless instrument, philosophically constructed, patented December 10, 1867, and again improved and perfected in 1873. It is the most ingenious and perfect instrument ever invented for exercising the eye. One application oftentimes increases the flow of the humors which support the cornea so as to restore all the vital force and power; so that the proper focus can be had and the desired object seen at once WITHOUT THE AID OF GLASSES.

This invention is new in principle and novel in construction. It combines every good quality and correct principle of all the best instruments yet constructed, while it is free from all their defects and imperfections; added to these it possesses its own peculiar merits, for which LETTERS PATENT have been granted, from time to time, by the United States Government.

We are daily receiving practical proof of the utility and superiority of the Duplex Eye-Sight Restorers. For example:

“An honest, industrious, and intelligent farmer, of New Lebanon, Columbia County, New York, who for many years believed that his failing sight would soon leave him blind, was often heard to quote sympathizingly Milton’s words:

‘Oh! loss of sight, of thee I most complain.’”

He wrote he would freely give one-half of his worldly

goods to recover his fast-failing sight. He writes:—"I have paid hundreds of dollars to different doctors and oculists for advice, medicine, and one surgical operation, without receiving any benefit. I have bought and used all the salves and Eye-waters and lotions that I ever saw advertised. When hope had almost failed, a friend persuaded me to try the Duplex Eye-Sight Restorers. I ordered a pair at once on his recommendation, and I must say that neither before nor since have I invested ten dollars with such good result.

"The first application improved my sight but seemed to weaken my eyes. I afterward learned from you

FIG. 17.



BEFORE!

that that peculiar feeling was the starting and flowing of the AQUEOUS and VITREOUS humors which had become almost dormant.

"After the second application my sight improved wonderfully, and within a week I could read and write by day or night comfortably without glasses.

"The sensation now produced while using the Restorers I find very agreeable. I assure you, I rather like it. My eyes are now as strong as anybody's.

"I close thankful that you have discovered what long-lived people so much need.

"Remaining grateful to you for my renewed sight, I say, 'Long live the inventor; a thousand blessings be on him!'"

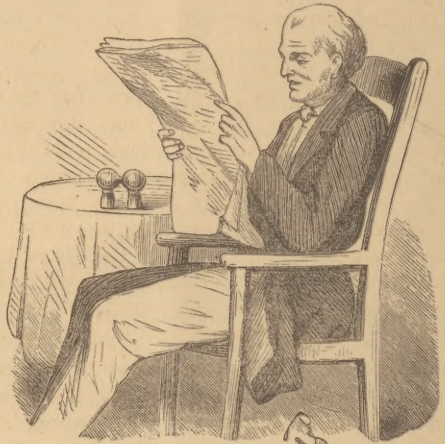
John Quincy Adams, sixth president of the United States, never wore spectacles; although he lived to the advanced age of 81 years he preserved his eye-sight undimmed, by pursuing from an early age the habit of pressing the ends of his fingers in the eye-sockets,

bearing against the eye-ball, and always, after washing, rubbing the globe or ball of the eye TOWARD instead of from the bridge of the nose.

His theory was that the eye needed some such exercise in order to retain the perfectness and convexity of the Cornea, and preserve the lens as originally designed by the Creator. This practice kept up a healthy flow of the aqueous and other humors, and of course preserved his sight.

From childhood to old age, people are in the habit of rubbing their eyes. If there is any itching or irritation in the eyes, they are rubbed. If one becomes tired by

FIG. 18.



AFTER!

reading, he throws himself back in his chair, and involuntarily rubs his eyes. If he looks at the sun, gas-light, or at any one object steadily, so that the eyes become dazzled or mystified, up go the fingers, and the eyes have a good rubbing. The mechanic at fine work, requiring close attention, rubs his eyes many times a day, and the lady with her embroidery, or sewing of any description, does the same thing.

The continued manipulation, particularly in the careless way it is done, greatly flattens the face of the eye, so that few arrive at the age of fifty who are not compelled to adopt spectacles, while many have to use glasses of some kind at a much earlier age. Now, repeated pressure upon the face of the eye or upon the cornea, as it is called, has done the mischief. It is proposed, by a pressure upon the sides of the cornea, to restore its prominency at the centre, and give convexity to this outer capsule of the aqueous lens. Is there anything unreasonable in this?

THE EYES.



SIGHT is perhaps, taken singly, the most valuable of our faculties. The high value set upon the eye is indicated by many figurative expressions in daily use, and everyone must have noticed the instinctive pride we all feel in the possession of good sight. People will boast of their sight who are beyond boasting of anything else, and those who unfortunately are obliged to admit that now the faculty is failing, will still find comfort in assuring you that in early life they were 'remarkable for strong sight.' Those whose sight has failed, almost always date the commencement of their defect as quite recently, long after the time at which it must have begun. Whilst this instinctive sense of its value renders some people painfully apprehensive as to very slight symptoms, it renders others—and the majority—absolutely unable to admit, even to themselves, that there is anything the matter. Surgeons who practice in diseases of the eye often meet with curious illustrations of this, and have great difficulty in convincing those who have in reality lost half of what they ought to possess, that they are not rich.

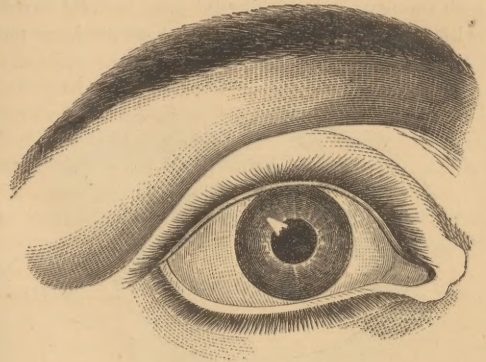
Observing the immensely increased value of sight to civilized man, it is a matter of congratulation that blindness is far less frequent than among savages. With a little allowance for the effects of climate and of occupations, it may be asserted that the higher the civilization, the smaller the proportion of those who are blind, or who suffer from irremedial defects of sight. In the United States and England, perhaps, it is smaller than in any other part of the world. In Egypt, India, China, and Japan, the number is very large indeed; and one of the most valuable qualifications of the medical missionary is a knowledge of this part of surgery. The way in which civilization brings about this splendid result—one for which we can never be too thankful—is partly by improving the general sanitary state, diet, clothing, &c., but chiefly by the increased care of the organs and the scientific treatment of their diseases.

Even in the United States there is still much that might be done toward the preservation of this valuable faculty, were the true nature of its disorders better understood; and it is not only among medical men that a wider diffusion of knowledge in this matter is to be desired, but also among the public at large.

In the following article the endeavor will be made, not only to exhibit the eye and its endowments as an interesting lesson in physiology, but also to supply information as to some of the common causes of its failure, and the best means for their prevention or remedy.

We will speak first of the parts which are seen on looking at the front of the eye. In order to better understand and remember what is described the reader will do well to borrow a friend's face for a few minutes' close examination.

FIG. 4.



THE EYELIDS WITH LASHES, ETC.

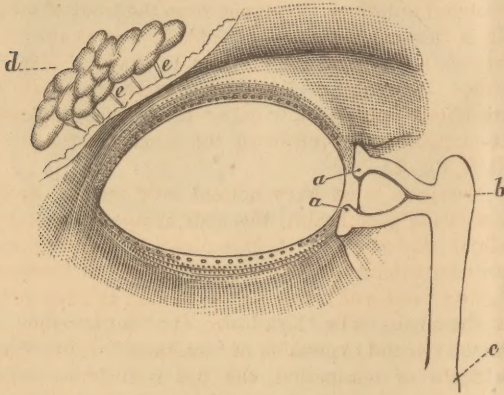
First we have **THE EYELIDS**. These are two moveable folds of skin intended to protect the eye. In order to stiffen them and make them fit well there is placed in each a narrow strip of gristle (or cartilage). You will observe that the upper lid covers the eye rather more than the lower; that the edge of the lower lid is nearly straight—that of the upper arched; and, lastly, that the upper lid moves more freely than the lower one. The upper lid can be lifted at will considerably, but the lower one can be but very little drawn down. Both can be moved freely in the act of closing the eye. The upper lid has a special muscle by which it is lifted. The muscle by which we close the lids is common to both. Under each lid there is a sort of pouch, or hollow, which may be easily seen in the case of the lower lid by drawing it down. Into these pouches, little particles of dirt, insects, wings, bits of chaff, straw, &c., sometimes get, and there lie hid, causing much irritation to the eye. From such positions they are often difficult to dislodge. They lie out of sight, and it is necessary to turn the lid over to expose and remove them. If surgical aid be not at hand, it is sometimes possible, by taking a hair and doubling it, and then pushing the noose up under the lid, to draw them out.*

At their outer corner the two lids meet and join at a sharp angle, but at the inner corner they do not quite meet, but leave a little round space between them. In this inner corner you will observe a red, fleshy-looking mass, about the size of a pea; this is a gland, which is of much larger size in some of the lower animals than it is in man. It is in the little pond, or hollow, which exists at the inner corner of the lids, that the tears collect before they escape away into the nose. When a person cries, the tears are so freely poured forth, that they cannot all escape by the channels to which we refer, and, in consequence, run over the cheeks. In a certain sense we may be said, however, to be always crying quietly. Tears are constantly being formed, and having passed over the surface of the eye, escape without observation into little channels which lead into the nose. A sharp-sighted person may easily find the open-

*These remarks apply only when the intruding body is far under the lid. From the latter situation the best way to remove it is to oil the end of a finger, and then carefully touch the eye: this is easily borne if gently done. The finger end may be covered with a soft handkerchief; its front surface, not its tip, should be used. Olive oil or castor oil will do: the latter is the best for the purpose.

ing (close to the inner corner of the lower eyelid) into which the tears enter. The lid must be held down, and it will then be seen as a round dot, about large enough:

FIG. 5.



THE EYELIDS WITHOUT LASHES, ETC.

d. The Lacrymal gland, which secretes the tears, and *e, e,* its excretory ducts, which convey the tear fluid to the surface of the eye. *a, a.* The openings of the tubes for the escape of the tears. This fluid is then carried through the lacrimal canals into the lacrimal sac *b*, thence along the nasal duct from *b* to *c*, the cavity of the nose.

to admit a pin. There is another in the upper lid, but it is not so easy to find. If a pin were pressed into this little hole, it might, if dexterously managed, be made to find its way inwards and downwards into the nose, for there is an open tube or channel the whole way. Many troublesome diseases result from the stopping up or narrowing of these delicate canals, the chief symptom of which is the overflow of tears on any slight irritation—such, for instance, as exposure to wind.

As regards the formation of tears, it is necessary to remark that, although formed in part by a sort of oozing from the whole surface of the eye, they are chiefly poured out by the large gland (*d*) provided for that special purpose, and, as you may see, placed deeply above and to the outer side of the eyeball. From its position, the water it forms must pass over the surface of the eye before it can escape at the inner corner. By this arrangement the eye is better washed, and any particles of dust, etc., are carried away.

At the margin of the lids we have THE LASHES; certain rows of stout hairs, which grow in beautiful curves, and which serve both to adorn the features and protect the eye. Close to the roots of the lashes there are, as is the case with all hairs, certain little glands, which form a sort of oil and allow it to escape upon the hair, so as to keep it from drying and cracking. Near to the roots of the lashes, but not actually opening upon them, are also other and larger glands, which form a kind of wax; this being poured out at the edge of the lid keeps it always coated, and thus prevents the tears from running over it. You may see these glands by drawing the lower lid down. They look like little yellow streaks about a quarter of an inch long, and appear to be somewhat knotted. In the woodcut (Fig. 5) we show, first, an inner row of small holes, the openings of the glands, and secondly, a number of yet smaller holes outside these, and arranged rather irregularly in two or three rows; these are the openings from which the

hairs have been pulled out. At the inner corner of both upper and lower lid, a large black dot (*a, a*) marks the opening of the canal for the escape of the tears towards the nose. All these glands are liable in certain states of the health, and especially after measles in delicate children, to inflame, and a sore looking red edge to the lid is then produced. To cure this, in bad cases, surgeons often pull out all the lashes, and sometimes repeat the process several times. The lashes always grow again, and usually, IF THE EYE IS PROPERLY EXERCISED, better than before. About four to six weeks is long enough for them to be reproduced in full perfection.

Now look at THE FRONT OF THE EYE ITSELF. (Fig. 4.) You will notice a round part like a watch-glass, about the size of a sixpence, and set in a white structure which surrounds it. This white structure extends backwards out of sight completely round the eyeball, and is its chief coat or wall. It is called the 'sclerotic,' (see C, Fig. 2 and 3) from a Greek word, signifying that it is dense and strong. The clear part, which we compare to a watch-glass, is called the 'cornea.' (See E, Fig. 2 and 3.) Through this clear cornea you look into the eye, and we now have to observe two parts, the black part in the middle, called the 'pupil,' (see A, Fig. 2 and 3) and the colored part which surrounds it, called the 'iris.' (See B, Fig. 2 and 3.) The cornea is convex, like a watch-glass; the iris is flat, like the watch-face. Between the cornea and the iris a few drops of clear water are placed. Now let us try the effect of light upon the iris and pupil. Close one eye altogether; shade the other with the hand for half a minute, and then suddenly expose it to a bright light. You will find that the pupil enlarges very much when shaded, and closes when exposed to light. This is effected by the iris, which is a sort of screen, attached only at its rim, and with a hole (the pupil) punched through its middle. In noticing its contraction on exposure to light, you have learnt the chief use of the iris; it is a shade intended to shut off glare, and to regulate the quantity of light admitted. Look at the pupil of a young child, and compare it with that of an adult, and then with that of an old person. You will find the child's large, that of the adult smaller, and that of the old man very small, perhaps little larger than a pin's head. The size and brilliant blackness of the pupil have much more to do with the expression of the eye than has the color of the iris. Hence the comparative want of expression and of lustre in the eyes of old persons, and much of the sparkling beauty of the eyes of the young. An unusually large pupil generally implies delicacy of constitution. The fact that it gives expression to the eye has, however, been so fully recognized, that, in Italy, ladies are reported to employ a drug for the purpose of obtaining it. This drug has from that circumstance received the name of 'belladonna,' or 'the beautiful lady.' It is needless to say, however, that its use confuses the sight, and that such fancied beauty is very unwisely purchased.

Now let us look closely at the IRIS, and admire the beauty of its structure. That the color of the iris may vary in different persons, everyone knows; for it is this structure which gives what is called the color of the eye. You will see, on minute inspection, that its color varies at different parts in the same person, and also

that it presents various lines and markings of great complexity and beauty. The iris, although a great aid to distinct vision, is not essential, and now and then persons are born without it who still enjoy tolerable sight. The iris is about as thick as stout blotting paper, and, whatever may be its color in front, it is always of a deep brown, almost black, behind.

We have already said that the pupil is merely a hole through the iris. It looks black, just as a hole into a dark room would do; but the structures behind it are quite clear and colorless. It is through this hole, the pupil of the eye, that the rays of light enter.

With this brief description of the pupil and iris, ends what we have to say as to the structures which can be seen on looking into another person's eye. Before proceeding to explain the yet more important ones which lie out of view, we must ask attention to a few other points.

The eye, as everyone knows, is a 'very sensitive organ.' Why is this? Because it is richly supplied with nerves. Every movement of the eyelids, every alteration in the size of the pupil, is accomplished by means of these nerves, which, like so many microscopic telegraph-wires, connect the various parts and send messages between them with vast rapidity. Is there too much light, the iris is ordered to contract; is the glare extreme, the lids also are made to close. The influence of the nerves does not, however, end here. Through their power the flow of tears may be increased or lessened. If a particle of dust is lodged in the eye, pain is the result, and this pain, quite apart from any effort of the will, makes the eye water, causes an overflow of tears, by which probably the offending body is washed off. Most persons are aware that one of the best ways of dealing with a gnat in the eye is to close the lid for a minute or two. A large accumulation of tears is the result, and on suddenly opening the lids the offending midge is carried away in the deluge.

In figures 2 and 3 we see exposed some of the nerve-trunks which supply the eye. Each one of these, although not thicker than a hair, would be found, on inspection with a microscope, to consist of a bundle of very minute tubes, each isolated from its companion by a sheath, much as telegraph wires are cased in gutta-percha, and then put together in one rope. These nerve-tubes have different duties to perform—some carry to the brain the sense of pain or other feelings (nerves of sensation), others carry from the brain orders to act, either to muscles or to glands. It is by these latter or motor nerves that the pupil is altered in size, and that we are able to fit the eye at one moment for looking at a distant prospect, at another for reading the smallest print. It is by the nerves which act on the glands that we regulate the flow of tears in crying, and by the irritation of which the eye 'waters' when anything has got into it. If a certain branch of nerve were paralyzed, the power of shedding tears on that side would cease, and the patient would be placed in the ludicrous position of being able to cry only with one eye. Such cases occur now and then.

We have omitted to say anything as to what may be called the skin of the eye. The lids are lined, and the front of the eyeball covered, by a very delicate, almost transparent membrane, which differs chiefly from skin

in that it is constantly kept moist. It is continuous with the skin of the eyelids at their edges. On the front of the cornea it is quite transparent and invisible, but it is still there, as is proved in the case of serpents, which shed their skins once a year, and with it a perfect and unbroken membrane from the front of the eye. It is this membrane which chiefly carries the blood-vessels, and which becomes red in cases of inflammation. It is also well supplied with nerves. This membrane is technically called the *conjunctiva*, because it connects and covers in all the other structures. (See R. S, Fig. 2.)

Everyone must have noticed how readily, even in persons in good health, the eyes sympathize with any slight disturbance. A bad night, or any temporary nervous exhaustion, will make the eyes feel heavy and 'gritty,' and will cause the lids to look swollen and red at the edges. The 'lack-lustre eye' is proverbial, and to the general expression of 'seediness' which follows a night of dissipation, the eye contributes perhaps more than any other part of the physiognomy. All these little changes are brought about by the influence of the nerves on the blood-vessels of the conjunctiva and other structures of the parts.

In almost every village there is some Lady Bountiful, to whom the poor resort for 'eye water,' when they need it. It is related of a French quack doctor, that having realized a large fortune by the sale of a secret remedy for ophthalmia, he was on his death-bed the subject of much compunction on the score that his specific had been, as he then explained, only river-water colored. His surgeon told him to quiet his qualms, and assured him that it would be well for the public if all nostrums for this purpose were equally harmless. The household remedies in vogue usually consist of some weak mineral solution, alum, sulphate of zinc, and the like. These remedies, as well as all eye-washes and eye-salves, are very unsuitable to a large proportion of inflammations of the eye. Their chief evil is that they do actual harm, and that they often prevent those who ought to obtain proper and well-skilled advice from doing so sufficiently early. For slight colds in the eye, a weak astringent, such as cold tea (add six to ten drops of glycerine to a cup of the tea) is quite suitable; but let us enforce the rule, that on no account should anything else be trusted to when there is pain or redness in the eye, or in the inflammations which occur in infants. This is our remedy.

Here we may suitably explain the real meaning of some expressions in popular use as regards diseases of the eye.

A 'blood-shot eye' is an eye in which the minute blood-vessels are much enlarged, and thus parts which should have been white become more or less red. This condition generally implies inflammation.

A 'watery eye,' or—what is sometimes synonymous—a weak eye, means the condition produced when, owing to the stoppage of the minute channels for the tears, the latter find their way over the cheek. The term 'weak eye' is often applied to states of long persisting inflammation of the roots of the eyelashes.

'White specks on the eyes' are produced whenever ulcers on the cornea, which ought to be perfectly clear, have healed and left scars. Such white specks are the

natural result of the healing process, and are quite inevitable after many inflammations. As the ulcer heals, it becomes whiter and whiter; and then, after a long time, the film slowly clears away, and, in the course of years, may almost disappear. No surgical art can take these specks away, though certain operations may sometimes be performed for obviating their effect on sight.

A 'cast' or 'squint' is said to exist whenever the direction of one eye does not correspond with that of the other. In a state of health, the two eyes move together with admirable and instantaneous precision. If they did not do so, we should see two objects instead of one. A squint may occur either inwards or outwards. When inwards, which is by far the more common, the person becomes 'cross-eyed,' and obtains a peculiarly sly expression, as if he were anxious to look into two places at once. When the squint is outwards, the defect in expression is greater, for it makes the countenance look somewhat silly and vacant. The movements of the eyeballs are accomplished by little slender muscles which adhere to its sides, and pull it, now in one direction, now in another. These muscles are chiefly four (see fig. 6), one above, one below, and one on each side. They do not stand off from the eye, as shown in the woodcut; on the contrary, they fit closely to its sides, like narrow strips of India-rubber on the sides of a marble. (T, U, V, Fig. 2.) If any one of these muscles becomes either stronger or weaker than its antagonist on the other side, a squint is produced. Some surgeons cure squints by cutting the stronger muscle through, and thus weakening its hold upon the eye. The operation is, to a dexterous hand, quite a simple one, and of course does not involve, as some fancy, 'taking the eye out and turning it.' Many persons who squint procure spectacles, but many squints might be prevented by the timely use of the Duplex Eye Sight Restorers. For they will cure the worst kind of squinting.

As we have said that unless the two eyes move accurately together, we see objects double, it will perhaps occur as a difficulty to some who may have experience of squinting, that these persons are not usually troubled with double vision. The explanation is this: When a

squint first occurs, all objects are seen double. This is extremely perplexing and tiresome, and to get rid of it, one eye learns not to see, or, to speak in professional language, one image is suppressed. Thus squinters use only one eye at a time. A very curious and instructive result follows on this disuse. The eye which is intentionally made to remain idle becomes almost blind. Now, if an eye had been disused in consequence of a large speck in front of it, or a cataract, it might have remained so for twenty years, and not have become blind; so great is the difference in result from enforced and from voluntary disuse! A sermon might be preached on this text. What a warning for the idle, and also for the ascetic! that we cannot voluntarily decline to use any of the faculties with which we are endowed, without risk of entire loss of that which we thus neglect! To equalize the strength of the muscles of the eye and restore lost power use the Duplex Eye Sight Restorer—The Great Eye Exerciser.

Let us make clear a few experiments:

1st Exp.—Look through the window, standing within a foot of the pane, and fix your sight on the particles of dust on the latter. By an effort, you can see them definitely and sharply. Now look out into the street or garden, but exactly in the same direction. You will find that when doing so you lose sight of the specks on the pane, and that to see them again you have to alter your eye, so that you do not see the distant objects. It is clear that your eye when looking at a near object is in a different condition than when looking at a distant one. Now take an opera-glass or a child's telescope, and having adjusted it accurately for some object at a great distance, try to use it for a near one. You will find that the same adjustment will not do, and that you must alter the screw. Surely there is something in your eye which has the same effect as the screw of the opera-glass, and by altering its adjustment gives you the power of seeing accurately at one time the most distant objects, at others the nearest. We have said the nearest; but no, there is a limit here. It does not matter how far objects are off, provided they are large enough; the stars, the moon, etc., you can see them clearly, but not so with near objects. Try this page. Nearer than eight inches (if you have properly formed eyes) you cannot without a sense of straining effort read the type, and nearer than five all is blurred and indistinct. The same occurs with the opera-glass. You cannot by its screw adapt it for very near objects. With it, as with your eye, there is a limit to 'adjustment' or 'accommodation.' We have found, then, that it is in looking at near objects that an effort has to be made, and hence the reason why small objects near to one are so trying to the eyes, whilst a distant prospect rests and strengthens them. Before we examine how accommodation is effected, we must try another experiment.

2nd Exp.—Take any strong magnifying glass, and hold it at a little distance from a wall in front of a well-lighted window. You will find that it depicts upon the wall a much reduced picture of the window, and that this picture becomes bright or blurred according to your care in holding the glass at a correct distance. You cannot move it ever so little, either forwards or backwards, without disturbing the brightness of the im-

FIG. 6.



THE FOUR STRAIGHT MUSCLES OF THE EYE.

The muscles are here shown lifted up from the ball, to exhibit their attachment on its front surface, not far behind the edge of the cornea and iris.

age. Notice that the image is wrong side up or inverted. Now the eye consists essentially of a magnifying glass thus used, and it paints pictures within itself exactly in the same manner. Certain parts are of course added to it, which must facilitate the performance, but the lens power is the essential. (See Fig. 2.) The lens is enclosed in a dark chamber, so that the brilliancy of the picture may not be damped by rays of light coming side ways, the iris is provided in front to regulate the quantity of light admitted, and lastly we have a nerve surface to receive the picture, and nerve-trunks to convey the impression to the brain. The lens power of the eye is produced in part by the cornea and its contents, in part by the 'lens' itself, and in part by the vitreous humor behind it. Their combined power is about equal to a magnifying glass of one inch focus. You will see in fig. 2 how they are arranged.

Now let us try to explain how 'accommodation' is effected. In the case of the opera-glass it is done by the screw, which increases or lessens the distance of the glasses from each other. In the eye we have no screw, nor is it possible materially to alter the distance of the parts from each other. The result is gained by making the lens itself more powerful at one time than another. This lens is placed just behind the pupil, and is about the size and shape of a small 'acid-drop.' It is of firm structure, but not hard, and is capable of being squeezed so as to become more convex. G, in fig. 2, shows its shape and size and place in the eye. Accommodation is effected by making this structure more or less convex, and this is done by a muscle which exists within the eye and surrounds the margin of the lens. (See N, Fig. 3.) Why accommodation should be necessary, we will next try to explain.

Every object that you can see becomes visible by the rays of light which it either gives off or reflects. Luminous objects—the sun, a candle, etc.—originate their own rays; all others reflect those which they have received. If an object reflected no light, it would be black, and invisible. The type which you are now reading is in a strict sense invisible; it is the white spaces between the letters which reflect the light, and which are really seen. Now, rays of light always proceed in straight lines; they are capable, as we have seen, of being reflected or thrown back by any surface on which they strike; they are capable, also, let us now assert, of being refracted or bent out of their usual course by any transparent substance through which they pass. Transparent substances refract light in differing degrees according to their degree of density, and according to their external form. Our next assertion shall be, that all rays of light radiate, or, in other words, proceed from a point forwards in all possible directions. Make a dot near the edge of a sheet of paper, and then with a ruler draw as many straight lines from it as you possibly can, none of them quite touching anywhere but at the point of starting. This will give a good idea of how rays of light diverge, and how a pencil of light is formed. You will easily see that in no position could the pupil of the eye possibly receive all the rays of light, and that the farther off it was carried, the fewer it would get.

Now, imagine that these lines were prolonged not only across your sheet of paper, but across a wide room,

or across a field. Under such circumstances, only those rays which were in the middle, and nearly parallel with each other, could possibly enter an observer's eye; all the rest would have diverged and passed away to the sides.

Two things have, it is hoped, been made clear by these statements. First, we have shown why it is so difficult to see distant objects, unless they are of large size, or well lighted; and, second, that we see distant objects by means of rays of light which are parallel, and near ones by the aid of rays which are divergent. Now, since both the divergent and the parallel rays must be focussed at the same place (the bottom of the eye), it is clear that the apparatus must, in order to effect this, be accommodated. In order to deal with divergent rays (those from near objects), the lens must be made stronger, or, in other words, more convex. We have already stated that this is effected by a muscle which exists within the eye. When this muscle is at rest, the eye is adapted to receive and focus parallel rays from distant objects; when in action, it can focus divergent ones. Hence the feeling of effort and fatigue which often results from long looking at small objects.

A, B and C are figures exhibiting the progress of luminous rays through the eye. (See Folio 12.)

It may possibly have occurred to some unusually attentive and intelligent reader, that we are involved in a little difficulty in asserting that effort is needed for near objects. Do not, it may be asked, the parallel rays from a near object gain access to the pupil as well as the divergent ones; and if so, why cannot we use them without effort, just as we use them when at a distance, and when we receive them only? The explanation is, that the divergent rays which are received with them confuse the image. If they could be excluded, then the eye could use the parallel rays as well close as miles away. To be certain of this try another simple experiment. With a fine needle prick the smallest possible hole in a card, and then try to read, looking through this hole, and putting the card and the page, close to the eye. You will find that you can see letters through such a hole which are all blurred and indistinct without it; you can, in fact, read at an inch distance from your eye, whereas without it you cannot read at shorter distance than eight miles.

The eye may be imperfect as an organ of vision without there being any actual disease, and merely on account of some peculiarity in its form, or peculiarity in its apparatus for accommodation. A GREAT MANY PERSONS ARE BORN WITH THEIR EYEBALLS A LITTLE TOO LONG OR TOO SHORT, and hence great inconvenience in using them. It is only *when the eyeball is exactly the proper length*, that its use as an optical instrument—its adjustment, &c.—can be perfect. When it is of proper length, then the sharpness of sight will be found to be almost exactly the same in all persons. There are limits as to the size of objects which can be seen both in the distance and near to, and these limits are about the same for all persons whilst the eye is in a state of health. We will now explain some of the common defects.

OVER-WORKED EYES. WEAK SIGHT.—We have proved that muscular effort is necessary to see near objects; the smaller and nearer, the greater the effort. Now, the muscle of accommodation, although ac-

FIG. 7, A



Fig. 7, A.—Represents an eyeball of exactly natural length, with the proper convexity. The object seen is designated by 1, on the book. 2 is the cornea, which collects and unites the rays of light into one point on the retina. 3 is the image on the retina properly focalized.

customed to long work, may yet under unusual stress tire and fail. When it does so, the eye becomes unable to see near at hand, and is compelled to rest. It is just as if you had been long standing on tip-toe to look over a wall; there comes a time when you can do it no longer. This over-fatigue is very common to those who read or write much. Professional men, students, book-keepers, needle-women, engravers, printers, and the like, very frequently suffer from it. Indeed, any of these occupations when pursued, as they are by some, for twelve or sixteen hours a day regularly, always wear the eyes out too soon. In many cases the eyes will,

on long. This symptom indicates the need for a suitable Eye Exerciser. It is only quite lately that it has been found out that this kind of weak sight results simply from the shortness of the eyeball. We owe the discovery to Professor Donders of Utrecht, and thanks to him, thousands now enjoy by the use of the Duplex Eye Sight Restorers perfect sight, who formerly would have had to go through life with a constant and great deficiency. The prejudice against spectacles for young persons used to be, and is now, very strong. Now and then even young children discover that they can see much better in their grandmothers' glasses; and when

FIG. 8, B.



Fig. 8, B.—Represents an eyeball much too short (weak-sighted) with the cornea too flat. The book is the object to be seen. 2 is the cornea, too flat to draw together the rays of light or converge on the retina, but would do so at some distance beyond 4. 3 is where the image would fall, but the retina not being there to receive it, the image is diffused and indistinctly seen. Hence we call it Dimness of Vision, commonly called blurring.

however, bear without detriment an extraordinary amount of work.

We have compared the effort of looking long at small print, &c., to the effort of standing tip-toe; and to follow the comparison, it is clear that the shorter the individual, the more fatiguing would be the effort of looking over a wall. Just so in the case of the eye: the shorter the eyeball, the greater the muscular effort necessary. Now, a very large number of persons have the eye from birth a little below its proper length. Such persons are obliged to employ the muscle of accommodation much more than others, and are very liable to suffer from its over-fatigue. They complain that they can see well for a little while, but cannot go

such is the case, the Duplex Eye Sight Restorers ought always to be applied. If they are not, the symptoms of weak sight and of over-worked eyes are almost certain to be developed.

SHORT SIGHT occurs when the eyeball is too long—egg shaped instead of round. It is very common, and runs in families. The eyeball is usually too long from the time of birth, but it often increases in length subsequently. A person who is the subject of short sight, enjoys excellent vision for near objects; he has, in fact, a microscopic eye, and can 'inspect a mite' in much more detail than another. He pays for this gain in one direction by a loss in another. He cannot see objects in the distance—cannot 'comprehend the heavens.'

FIG. 9, C.



Fig. 9, B.—Represents an eyeball with the cornea too convex and the eyeball much too long (short-sighted). The book 1, is the object to be seen. At 2, we see the cornea too convex. At 4, the rays of light are converged and focalized, forming the image before reaching the retina. At 3, the image should be formed to be distinctly seen. Hence we call such sight Myopia, Short or Near-sightedness.

Often, however, he will go through a large part of life rejoicing in his advantage, and quite unaware of his loss. Having no standard of comparison, he believes that the manner in which he sees into the distance is the best attainable. An adult myope* who has never tried the Restorers is amazed, on using them for the first time, at the clearness with which he sees that which always before had been hazy and indefinite.

The reason why a long eyeball disables for distant vision is, that the lens of the eye being too forward, its focus is in front of the bottom of the eye, instead of exactly upon it. Thus, the eye can use divergent rays more easily than one of proper length, but cannot focus parallel ones at the proper place. This may be corrected by the use of a concave glass, which will make parallel rays diverge. Thus, we understand why myopes use spectacles or an opposite kind to those required by old persons, or by the weak sight which results from a too short globe. The semi circle myopic attachment in connection with the Duplex Restorers, renders the eyeball more spherical, and gives it at once the proper shape, so that as soon as sight is restored glasses need never more be used.

Short-sighted persons acquire certain peculiarities of appearance. In the first place, their eyes often look full and prominent, and frequently have large pupils; next, from constantly trying to see better in the distance, they are apt to acquire a habit of 'screwing' the eyelids; and, lastly, from the necessity of bringing the head near to the object observed, a certain degree of stoop is apt to be developed. These bad habits may, in all cases, be prevented by the use of the Duplex Eye Sight Restorer. It is said that myopia even induces peculiarities of character, and that myopes are usually unsuspicious and easily pleased; being unable to observe many little matters in the demeanor or expression of those with whom they converse, which being noticed by those of quicker sight, might induce feelings of distrust or annoyance.

There is an opinion widely prevalent, that short-sighted eyes are strong eyes, and wear well. Unfortunately, this is a mistake; for, in not a few cases, this condition is progressive, and ends in a very serious failure of sight. It is quite true that, as a set-off for the fact that throughout life he has never been able to see clearly in the distance, the myope may in old age still retain his power of reading without glasses. In this sense, his eyes may last longer than those of his friends, but in no other.

Those who are short-sighted ought to observe a few simple rules in order to preserve their eyes. They should be careful to prefer large type for reading, and to hold the book up to the eyes, not bring the eyes down to the book. In writing, they should use a high desk, and on no account bend over a flat table. They should avoid, as far as may be, all close work, and relieve the eyes by frequent rests. Those who are short-sighted in but slight degrees, and those who are so in a considerable degree, as well as those who have the defect in very high degrees must be cautious, and use glasses only under skilled advice. In all forms, if too strong glasses are used, they will

increase the defect and irreparably damage the eyes. We have no wish to make the large class of myopes unduly anxious about the durability of their eyes. It is only in cases in which the sight gets shorter and shorter from year to year that alarm need be felt; then the necessity for a restorer and rest is urgent.

Unfortunately, short sight occurs very frequently in those who are of a studious turn, and who are consequently very likely to increase it by their habits. It is an exception to what we said in the beginning as to the influence of civilization upon the prevalence of eye diseases. It is a defect to a large extent due to the pursuits introduced by the inventions of civilized life. It is rare among those who cannot read, and among those who follow out-of-door pursuits; and is believed to be more common among the studious Germans than among any other nation. Although undoubtedly induced by occupation, it may be transmitted hereditarily.

OLD SIGHT (*presbyopia*).—It is often thought that old sight is 'long sight,' and that it is in some sense opposite to short sight; but this is a mistake. Old people have no advantage over the young as regards sight in the distance; they have simply lost the power of seeing near to. It would be strange indeed if advancing age, which slowly but surely robs us of our faculties, ADDED anything to that of sight. It certainly does not. The impairment which ensues from age is the gradual loss of the power of accommodation. We have compared that power to the screw in an opera-glass, or to the movement of the tubes of a telescope one within the other. We might extend the comparison, and suppose that by constant use the screw has got worn, and will no longer act. Very gradual indeed is the commencement of old sight. About the age of thirty-five, without our noticing it, we begin to be less able to see small things near to us, and by the age of forty-five we have learned instinctively to keep the book an inch or two farther off than we did in youth. From this period onward to old age, the faculty fails steadily until we become quite unable to bring a book near enough to read from it. This loss occurs to all persons whose eyes were originally of proper length, and it is far more exactly proportionate to our years than is generally supposed.

Even when no longer able to read at all without glasses, the power of dim vision may be perfect. For this, no accommodation is wanted, and it is that power which alone has failed. The eye is itself perfectly healthy, but the lens substance has got harder and harder. By use of the Duplex Eye Exercisers, or Eye Sight Restorers, the original form may again be restored, and then, as in youth, it can be made stronger when requisite. If the Duplex Restorers are not used the lens get harder than ever and flatter than before; and then its possessor will require always two pairs of spectacles for distant and near objects, though he will be able to see distant objects with much weaker glasses than those which he uses for reading.

Old sight can ALWAYS be remedied by the use of the patent Duplex Restorers, and it is most desirable that they should be used by everyone for eye exercise; they save the eye from fatigue, as well as improve its usefulness. They will enable any one to read readily at twelve inches distant.

*The learned term for short sight is *myopia*. *Myopic* means short-sighted; and a *myope*, a short-sighted person.

You sometimes notice at church an old man with his spectacles on the tip of his nose, and his Prayer-book as far off as possible. These are sure signs that he wants stronger glasses. The effect of putting the spectacles farther from the eyes is to increase their power. If any person insists on using glasses let them be changed often, so as to have them strong enough to allow of their being kept close to the eyes. It ought not to be necessary to hold the book more than a foot away.

CATARACT.—We now have to explain another very important and curious defect, which occurs chiefly in the aged. We have said, that as years advance, the lens gets harder; sometimes not only does it harden, but for want of proper exercise it changes from a state of transparency, like glass, to one of yellow haze, like amber or bees-wax, or even to a dense white, like spermaceti. When the lens has thus become opaque, a cataract is said to have formed. If you will look at figs. 2 and 3, you will easily see, from the position of the lens, exactly behind the pupil and in the centre of the eye, that it must, when opaque, prevent light from entering. Cataracts usually form slowly and without pain, and often take several years before they quite exclude the light. They are very common in the aged, as a mere result of age, and without any disease, and now and then they occur also in infants and in young persons.

The art of removing cataracts by the Duplex Eye Sight Restorers is one of the greatest triumphs over surgery, and is now the means of restoring sight to thousands who would otherwise be compelled to end their lives in darkness. In surgery, in certain cases, where the cataract is said to be soft, the surgeon is content to stir them up with a needle, and leave them to dissolve; but in others, and the majority, he makes an incision in the eye, and takes the lens bodily out. After successful operations for cataract, in surgery, the use of spectacles is always necessary, for one of the most important parts of the refracting apparatus has been removed, and must be replaced by a lens in front of the eye.

Formerly surgeons used to 'couch' for cataract; that is, instead of extracting the lens from the eye, they would, with a needle, displace it from the axis of vision and leave it in the deeper parts of the eye. By looking again at fig. 2, you will understand how this was practicable. It is a clumsy and imperfect procedure, and should never be thought of by scientific surgeons. We mention it chiefly in order to remark that now and then a cataract is displaced, or couched, by accident—a blow or a violent shake, for example—or even without any assignable cause. In such cases the astonished subject is suddenly restored to sight. It is very possible that some of the supposed miracles of the middle ages may have been cases of this kind. A short time since we interviewed one of the most skillful surgeons of our times, and, in relating to us some of his wonderfully successful operations for cataract, he said:

"Surgeons meet with very curious illustrations of the differences in human temper after operations for cataract. Often the most grateful triumph will be displayed at the restoration of even a very limited share of sight; and now and then an old woman will grumble, after a brilliant success, because she 'can't see well without spectacles.'"

By use of the Duplex Eye Sight Restorers a sur-

gical operation is avoided, the eye is re-shaped, the cataract removed and spectacles are rendered useless.

In addition to the common defects which have been described, and which are of great interest to the non-professionable reader as well as to the oculist, the eye, if not properly exercised, is liable to a great number of special diseases. A large group of these are seated in the deep parts of the organ, and cause more or less complete blindness without any thing being visible externally. Such was the condition of Milton:—

These eyes, though clear,
To outward view, of blemish or of spot,
Bereft of light, their seeing have forgot.

To this group the term **AMAUROSIS** used to be given, and a witty writer defined it to mean "cases in which the patient was blind and his surgeon could see nothing." The discoveries of modern science have, however, rendered this description no longer applicable. The oculist can now examine the deep parts of the eye just as easily as those on the surface. This is done by a little instrument named the **Ophthalmoscope**. By its aid, and with artificial light properly arranged, the interior of the eyeball, its vessels, the optic-nerve, &c., can be readily seen, and any disease which may be present easily appreciated. It is not practicable here to describe either its use or its revelations. We may remark, however, that many of the details of the eye as seen by the ophthalmoscope are exceedingly beautiful and interesting, and there is no reason why doctors should keep them to themselves. The instrument is as easily used as the microscope; and it is to be hoped that before long opportunities will be afforded to amateur physiologists as well as to professionals for enjoying the marvels which it displays. A countryman of our own, Mr. Cumming, made the earliest observations on the possibility of seeing into the living eye; but it was reserved for Helmholtz, Coccius, and Reute, of Germany, to invent and perfect the instrument which has, in a double sense, thrown such a flood of light on the obscure diseases of the eye. Their successful labors entitle them to high rank among the benefactors of mankind.

In reference to the diseases of the deep parts, we must say a few words respecting the **ANATOMY OF THE RETINA, &c.** By referring again to fig. 2, the reader will see that the optic nerve enters the back of the eyeball, or rather it passes backwards out of the eye, and thence in the skull to be joined to the brain. This nerve begins in the eye as a delicate outspread membrane, which lines the back of its cavity, and is in contact with the vitreous humor, which latter supports it and holds it in place. The retina is indicated in fig. 2, by I. This retina is the structure which receives impressions. On it, as on a photographer's plate, images of objects seen are focussed by the lens apparatus in front. By means of the optic nerve (a bundle of nerve fibres, or telegraph wires), the retina is made continuous with the brain; indeed, it may, in a certain sense, be regarded as a part of the brain drawn out of the skull, and packed within the eyeball to serve a special purpose. In structure, the retina consists of nerve-fibres, and of a very delicate and complicated arrangement of minute nerve-cells. Close behind the retina is **THE CHOROID**, a membrane which supplies the back of the retina with blood, and which also, being loaded with black pig-

ment, serves to absorb any superfluous light. In white rabbits, in albinos, etc., there is no pigment in the choroid, and hence the red glare of the eyes, and hence, also, an inability to bear strong light. Outside

the choroid we come to THE SCLEROTIC, the thick, strong, white membrane which gives form to the eyeball, and supports the whole of its marvellous internal mechanism.

OLD SIGHT AND SPECTACLES.



BEFORE!



AFTER!



HE use of the eyes to see near objects, in reading, for instance, is a muscular effort, and consequently subject to the general laws which govern muscular activity. This, at once, explains to you what the eye "*feeling tired*" means. You can hold out at arm's length a half pound weight for a certain length of time, but beyond a certain length of time it is impossible. Exactly the same with the use of the eyes in reading; for instance, the muscular effort of accommodation is exercised almost without sensation, till pushed beyond its power, when the ciliary muscle suddenly ceases to act, and the lens to be changed in shape, the consequence of which is that the letters run together, or are blurred, because the picture on the retina is not sharply defined; in other words, out of focus. The muscular effort, then, to adjust our eye, is accompanied with fatigue, and, if pushed further, with pain; so we are forced to stop and rest. Now, although man's most complete bodily development is at about thirty years of age, this muscular power of adjustment or accommodation is greatest in childhood, at about ten years of age, and becomes gradually less with advancing years, not perhaps, due so much to the want of power in the ciliary muscle as to the lens becoming less elastic, and thus not so readily or perfectly assuming a more convex shape when the pressure on it by the ligament is relaxed. We know that in infancy the lens is almost like jelly, and in old age as hard as wax.

This gradual loss of the power of accommodation is not naturally noticed till it is sufficient to effect our ordinary occupations, such as reading, sewing, writing, and other fine work; this it does generally, somewhere between forty and forty-five years of age. Then we see

our friends holding the newspaper further off, turning their backs to the window to get a brighter reflection from the page, thereby causing the pupil to close more and thus cut off the outer rays. After the fatigue of the day, the evening paper cannot be read with ease as before; the letters run together, and the eyes are tired and painful. After a few minutes' rests the paper can be read, but again soon blurs. This is the commencement of "*old sight*," which does not come suddenly, as often supposed, but is only noticed when it arrives at that degree which effects our ordinary occupations. This loss of accommodation goes gradually on till we cannot see any near objects, while the power for distant visions remains as in childhood, or but little impaired.

The highest authority on this subject, Prof. Donders, says that our social condition requires that we should often be engaged in reading, writing, or other close work. Even in the thirtieth year the normal eye dislikes the small print, which the near-sighted person prefers, and youth does not avoid. Still, in the fortieth year, ordinary type presents no difficulty whatever to the emmetropic or normal eye. In the forty-fifth year the notes printed in smaller characters are not unfrequently passed over, and the book is in the evening somewhat earlier laid aside. We now begin to observe that an object, to be very accurately seen, is removed a little further from the eye; a clear sight is also sought, rather for the purpose of diminishing the circles of diffusion on the retina in imperfect accommodation by narrowing the pupil, than of obtaining more brilliantly illuminated images. Ordinary occupations are, however, still performed uninterruptedly without remarkable exertion. But when minute matters, which now

and then occur, are to be accurately seen, comes the complaint, however unwillingly from the lips, that our eyes are no longer what they were.

It is, therefore, a perfectly healthy and normal eye which, between the ages of forty and forty-five, is obliged to be assisted by glasses if not properly exercised. It cannot go many years beyond this time unaided, without risk of injury and straining the power of sight. How is it, then, that many people, as we know, succeed in putting off the wearing of spectacles to a later age, when, perhaps, their eyes are *apparently* normal, or at any rate healthy, and have not troubled them through life? There are several reasons for this, easily explained:—Some of our friends will boast that they are fifty years old and never have worn glasses. If, however, you watch them, you will find they do no night work, and confine their newspaper reading to bright daylight, with the sheet held well off from the eye, and prefer the leaded leading articles. Paper-covered novels and such "poor print," are carefully avoided. There are many such people who, from a foolish sensitiveness, are laying up further trouble for themselves by refusing the aids which nature demands and science provides.

Another point is this: When the pupil, as is sometimes the case, is unusually small, and decreases in size with age, then the necessity for glasses is not so soon experienced, since the outer rays are cut off and the central ones are focussed sufficiently on the retina to afford good sight. Any one who wears even a pretty strong glass will be able to see near objects through a pin hole in a card without the glass. Thus, also, is simply explained the reason why some extremely old people are enabled to leave off their glasses which they had worn for years. The pupil has become extremely small, perhaps no larger than the head of a pin.

So far, we have been speaking of a perfectly normal eye, gradually losing its power of accommodation, and so requiring the assistance of a glass. There are two conditions arising from disease, one of which *prevents* the accustomed use of convex glasses, and the other necessitates their being *stronger and stronger*. It is of considerable importance that they should be understood, as much danger to the eyesight may be avoided. The first of these morbid states is *cataract*; that is, a gradual opacity of the crystalline lens. Now when cataract commences, the crystalline lens swells up and becomes thicker, which is exactly what it does every time we look at near objects, or, in other words accommodate. This gradual swelling of the lens is, of course, permanent, whilst, ordinarily, the lens resumes its flatter shape when we cease to look at a near object and gaze in the distance.

The other morbid condition is what we call *glaucoma*. The Duplex Eye Exercisers alone can save the eye attacked by this fearful disease, the cause of so many losing their sight forever. A person in middle age, or older, finds he must change his glasses for stronger ones, which do not last but a few months before resort must again be had to a still stronger pair. Pain and disturbance of vision now, perhaps, warn him that all is not right with his eyes, and he seeks medical advice, fortunate if some meddling friend has not persuaded him to apply to this or that advertising surgeon, charlatan or licensed quack, who persuades him that by fol-

lowing his advice he will recover. Finally, when sight has nearly gone, patience and purse exhausted, and the best, or perhaps only chance for a curative operation passed by, the unfortunate patient purchases the Duplex Eye Exercisers. In a few days he is cured of his disease, and enabled to lay aside glasses forever. Then very likely for the first time, the patient learns what advertising and licensed quacks are, and how he has by them been cheated of his money.

Now, then, we understand how very old people may see without their glasses; also how middle-aged or old people may find they can get on without them, which may indicate commencing cataract; and again, how the necessity for repeated change to stronger and stronger glasses may mean the coming on of one of the most dangerous diseases for the sight of the eye, namely, *glaucoma*. It is perhaps proper to mention here that *acute glaucoma* may produce very sudden blindness within a few hours.

A good many people find they can avoid the use of glasses, to considerably later period in life than others, on which they congratulate themselves as having extra strong eyes. The perfectly healthy normal eye, however, begins to need a glass for ordinary work at between forty and forty-five years of age. Now then, comes the question, shall we put on glasses, and of what strength? To answer some prevalent fallacies handed down from one generation to another, we cannot do better than quote from the highest authority, Professor Donders, who says: "The opinion is rather general that we should refrain as long as possible from the use of convex glasses. But is it not folly to weary the eyes and the mind together, without necessity, condemning ourselves to guess, with much trouble, at the forms which we could see pretty well with glasses?" We have here to do with a prejudice which, perhaps, finds some support in vanity. It is asserted, practice of accommodation is desirable. Generally speaking, this is perfectly true. To look alternately at distant and at near objects, now to occupy one's self with smaller, and now with larger objects, develops and maintains the functions of the eye. But we forget that we were obliged to practice more and more as years roll on, and that, by these efforts, increasingly necessitated by the diminishing range of accommodation, the power of using a great part of this latter has already been acquired. It is not, therefore, evidently absurd to commence, at nearly fifty years of age, a more powerful gymnastic system than youth was ever called to?

Strangely enough, people have fallen, also, into the opposite fault. Some have thought, by the early use of spectacles, to be able to preserve their power of vision, and have recommended and employed "conservative glasses." So long as the eye does not err, and remains free from fatigue in the work required of it, its own power is sufficient, and it is inexpedient to seek assistance in the use of convex glasses. Light-blue spectacles, also, which have been sometimes recommended as "conservative spectacles," are, under ordinary circumstances, objectionable for a healthy visual organ. Most eyes find their soothing influence agreeable, and people are therefore readily inclined to employ them. But, while they withhold from the retina the ordinary stimulus of white light, they increase its sensibility beyond

the normal, and create a permanent necessity for their employment. Now a more than normal sensibility is an inconvenience, and at the same time predetermines to disease.

Opticians and spectacle vendors know nothing about the laws which govern the refraction and accommodation of the eye. It is not their business, any more than it is the apothecary's to know about diseases. A perfectly healthy and strong eye, as age comes on, needs *about* the glass here indicated for writing: and for reading ordinary type. Glasses are numbered by the number of inches of the radius of the wheel on which they are ground, which is their focal length.

This table is taken from a most celebrated work on "Ophthalmic Surgery." Ophthalmic surgeons, in general, have adopted it, and they recommend all vendors of spectacles to be governed by it. We pronounce it very incorrect, but reproduce it here for no other purpose than,

"Out of their own mouths shall ye convict them."

To show the rapidity with which a healthy eye loses sight and the frequency that one is obliged to change spectacles to retain good vision:

| Age. | Convex Glasses required. | Distances of Distinct Vision in Inches. |
|------|-----------------------------|--|
| 40 | 60 | 14 |
| 48 | | |
| 50 | 40 | 14 |
| 55 | 30 | 14 |
| 58 | 22 | 13 |
| 60 | 18 | 13 |
| 62 | 14 | 13 |
| 65 | 13 | 12 |
| 70 | 10 | 10 |
| 75 | 9 | 9 |
| 78 | 8 | 8 |
| 80 | 7 | 7 |

The chances are, however, that should any one feeling they required convex glasses select them by this table, they would not choose the power which their eyes required, as there are a variety of circumstances to be taken into consideration; any diminished acuteness of vision, or any disturbance of accommodation, from whatever cause. We have already spoken of the influence of commencing cataract and glaucoma. The nature of the patient's work has to be considered. For instance, as to writing, whether this is to be a fine hand or in large registers; as to reading, whether this is fine type, or difficult like German text, or whether it is pulpit reading; as to money-sorting, whether only the denomination is to be seen, or the finer marks, used to detect counterfeits; as to occupation, whether engraving, watch repairing, or minute drawing, etc.; as to whether work is day or night-work, or both. It will be thus seen that there are very many circumstances which must absolutely be thought of and understood, in what, at first sight, seems so simple, namely, the selecting a proper pair of spectacles. This is all in reference to the strength of the glass, but other points must also be decided upon as well. Some of these are, whether the patient can or should wear springs or spectacle frames, what the shape of the glasses should be, round or oval, and how large, as well as how adapted to the nose. As we have to use stronger and stronger glasses, the first or

weaker ones, should be kept for day work, and the higher or stronger ones for night-work; as to how to wear glasses, whether springs or spectacles, so as not to fatigue the eyes by straining them from improper use. All advice in this article applies only to those having normal, healthy, strong eyes.

Who would not rather avoid altogether the use of bothersome spectacles through life? All may enjoy the truly wonderful BENEFITS sure to follow the occasional use of the Duplex Eye-sight Restorers.

On page 18, we introduce two wood-cuts (Figures A, B) to illustrate more clearly the subject of accommodation.

The RETINA is the true sentient portion of the organ of vision. Being perfectly transparent, it allows the light to come into the pupil to pass through it to the pigment layer.

The OPTIC NERVE, figure 2, as it comes from the brain through the cranium into the orbit, and so on to the eyeball, is a compact bundle of innumerable number of nerve fibres. They carry the impressions of light made in the eye to the brain.

Optically, we may regard the cornea, aqueous humor and crystalline lens as *one double convex lens*.

The study of the functions of the IRIS and CRYSTALLINE LENS when in the act of accommodation and when going to rest, or when receiving parallel or diverging rays of light; will, we trust, interest both old and young.

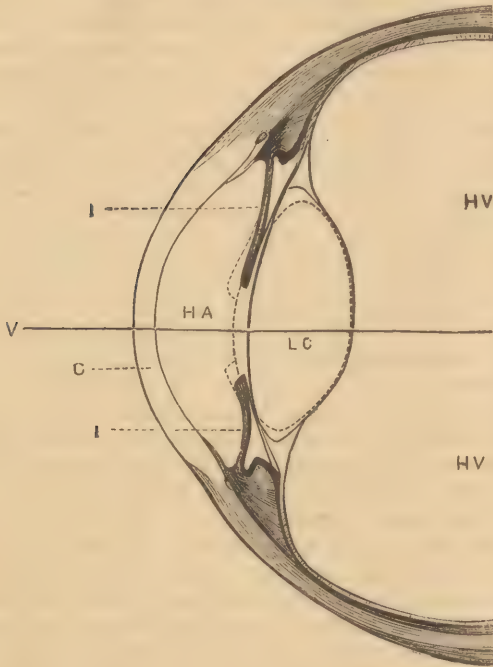
The IRIS is pierced with an opening called the pupil, and capable of alteration in size. The circular muscular fibres of the iris around the edge of the pupils, by contracting, reduce the aperture upon the stimulus of light penetrating the eye, and the radiating muscular fibres dilate it again when this stimulus is removed. The pupil is therefore larger in the dark than in the light. The use of the iris is physical, to regulate the amount of light and cut off all rays entering too obliquely. The posterior surface of the iris is covered with a black pigment. The anterior surface reflects light, and is iridescent. When there is but little pigment among the fibres, the posterior thick layer reflects to us a blue or grey, and when a considerable mass of pigment is there, we have a brown or dark eye. The action of the iris is not under the control of the will.

The iris is the colored part of the eye; a vascular and muscular membrane placed exactly like an optical diaphragm behind the cornea, attached to the sclerotic, where this merges into the cornea. It is shown in Fig. A, I I, and Fig. B, I A and I R. The posterior surface of the iris is like the choroid, thickly covered with pigment, the absence of which, in the albino animals, allows the light to pass directly through it to the interior of the eye. The space, H A, Fig. A, between the iris and the cornea, is filled with the *aqueous humor*—almost pure water. The iris thus floats, as it were, in this humor, and by dilating or contracting, makes the pupil larger or smaller, according to the amount of light the eye is exposed to, and also whether the rays are diverging or parallel.

Let us now study the figures A and B, together.

They represent enlarged pictures of the front part of the eye. In Fig. A, the dotted line shows the outline of the lens when it is accommodated.

Fig. A. FROM GIRAUD-TEULON.



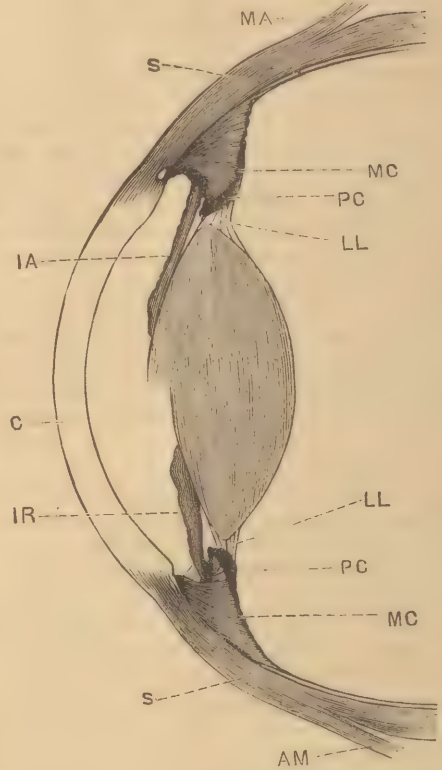
Enlarged section of the human eye. The line *V* is the axis of vision. *C*, the cornea. *HV*, vitreous humor. *LC*, crystalline lens. *HA*, aqueous humor. *II*, the iris. The dotted lines show the position of the iris and the shape of the lens when the eye is accommodated.

The dotted line in Fig. A also shows the position of the iris in accommodation. We said the iris laid against the lens; when, therefore, this latter changes its shape, the iris must be pushed forward. In Fig. B, *IA* shows the iris during accommodation, and *IR* when the eye is at rest. You notice there is a break in the front curve of the lens; the upper half of the figure represents the eye accommodated, and the lower half the eye at rest. This change in the lens is effected by its own elasticity when the suspensory ligament we spoke of (*LL*, Fig. B) is slackened up, as seen in the upper *LL*.

The pupillary edge of the iris lies against the anterior surface of the crystalline lens *LC*, Fig. A. Now, when we cut an eye in two and turn over the front half, we shall see surrounding this lens a radiated disc composed of from 60 to 80 minute folds, thickly covered with a black pigment, reminding us of the circular row of black seeds in some fruit or vegetable. These are called the *ciliary processes*. Fig. B, *PC*, *PC*, and are highly vascular. They may be considered as a continuation of the black choroid coat, lining the white sclerotic. Their free ends in front come up to, but do not touch the edge of the crystalline lens.

Let us now examine the **CRYSTALLINE LENS**, *LC*, Fig. A. You see it lies just behind the iris, the edge of the pupil being in contact with it. The human lens is a double convex transparent body, about one-third of an inch in diameter, and one-fifth of an inch in thickness, much more convex on its posterior than its anterior sur-

Fig. B. FROM JAGER.



Enlarged view of anterior half of the eyeball. *C*, the cornea. *S*, the sclerotic. *AM*, *MA*, attachment of two of the straight muscles. *LL*, suspensory ligament of the crystalline lens, by it the lens is held in its position and connected with *MC*, the ciliary muscle. *PC*, ciliary processes. *IA*, iris, in accommodation. *IR*, iris, when eye at rest. The upper half of the figure, down to the break in the front surface of the crystalline lens, shows the eye when accommodated for diverging rays of light. The lower half of the figure shows the eye at rest; i.e., adapted for parallel rays.

face. It is enclosed within a capsule of perfectly transparent material, which, although dense, allows fluid to pass through it. The proper structure of the lens itself varies with age, as we have before said. In the infant it is as soft as jelly, and in old age as hard as wax. With this increasing hardening of age there is a gradual change of the shape of the lens, it becomes flatter, and its two surfaces alter their relative curve. The lens increases in density as we go towards its centre. It is composed of fibres arranged side by side in concentric layers, and running from one pole to the other. These fibres are flattened, ribbon-like filaments, with interlocking serrations at their sides. The complexity of the arrangement of the fibres seems to be greatest in man, and less as we descend in the animal scale. You may have noticed how the crystalline lens of a boiled cod-fish, for instance, breaks up into segments and layers. There can be no doubt that this most beautiful and complex arrangements of structure serves to correct in the eye the faults we have to contend with in the glasses of our optical instruments. When this crystalline lens is *opaque*, it is called cataract, and the person cannot then see, because the light cannot pass through it to the

inside of the eye. In children and young people cataract is often soft, like sago or rice, and then when the oculist pricks the capsule which holds it, the aqueous humor runs in and absorbs or melts it, and the patient may again gradually have sight. In old people cataract is hard, like wax, and the way the oculist has of removing it is to cut a hole in the eyeball and take it out entire. People often mistake and speak of an opaque spot on the clear part of the eye or cornea, as *cataract*; but cataract, as you see, is a very different thing. Most all of the quack eye-waters sold in the apothecaries' shops under one doctor's name or another's contain *sugar of lead*. Now, if the surface of the cornea is rough and abraded, as it is very apt to be in many diseases of the eye, a solution of sugar of lead put into the eye will finally make an opaque deposit of lead in the cornea, so that the unfortunate purchaser of these quack eye-waters is apt to become permanently, more or less, blind; the removal of this deposit by the oculist being difficult and often impossible.

In Fig. B, M C, M C represents a muscle called the *ciliary muscle*, which is attached to the sclerotic just where this merges into the cornea, towards which point it pulls when contracting, thereby slackening up the ciliary ligament compressing the lens, which from its natural elasticity, takes at once a more convex shape, thus perfectly adapting the eye to focus on its retina, diverging rays of light coming from near objects. Now hold between your eye and a friend's lighted candle, and in the pupil of his eye you will see two, or perhaps three little images of the candle. These come from the cornea, the front and the back of the lens. It was by studying these images that three German physicians—Dr. Max Langenbeck, Prof. Donders, and Prof. Helmholtz—found out how the eye was accommodated; and, although it was published and mathematically demonstrated in 1857, you will rarely to-day find it in the works on optics studied at our universities and schools.

THE PUPIL OF THE EYE.



PROBABLY all have at some time noticed the pupil of the eye of our domesticated animals, for instance the cat or dog, light up suddenly, appearing of a bright color, or, as the phrase goes, glaring at you out of the dark or twilight. The pupil of the human eye is simply a round hole through the iris or colored part of the eye. All the media, as they are called, behind the cornea, the aqueous humor, the crystalline lens, and the vitreous humor, are perfectly transparent, so that they do not prevent us from looking through them to see the optic nerve where it enters the eyeball, and the little arteries and veins coming out from its centre to be distributed to the expanse of the retina on the inside of the globe. There must therefore be some reason for the pupil of the human eye appearing black. Like the animal's eye, however, it also sometimes lights up, or suddenly appears red. This is not unfrequent with those people whose pupils are large, as in young persons, or when the pupil has been dilated with atropine. It is so striking a phenom-

ena as to be naturally quite startling, and probably gave rise to the idea and the expression of the eyes "flashing fire." This natural effect was for a long time supposed to be produced by the eye *emitting* light from its interior, with the idea that it was phosphorescent. Aristotle, among those bodies which we now call phosphorescent, included the head, scales, and *eyes* of fishes. Since we now know that the interior of the eyes of several species of fish are lined with a brilliant colored pigment, we easily recognize why they were supposed to have the power of emitting light. Plinius speaks definitely of the lighting up in the dark of the eyes of nocturnal animals, as a cat. Goats also, and wolves are mentioned as emitting light from the eyes. It has therefore evidently been for ages noticed that the eyes of the nocturnal beasts of prey light up in the dark.

Dessaignes, in 1860, in a prize essay before the *Institut de France*, states, "animals' eyes have the power of lighting up, like a flame, in the dark." How the phosphorous got into the eye to emit light, was variously explained. Even Buffon said, "the sunlight which the eye drinks in by day, streams out again by night." Others had the idea that light was emitted through the pupil like the flash from the fire-fly. As late as 1818, Treviranus said: "In both men and cats the lighting up of the eyes seem to occur more often in summer than winter, particularly at certain times, and with cats perhaps also at a certain age. The cat's eye lights up when she is waiting in ambush, or meets something strange, or is enraged. The light comes undoubtedly from the interior of the eye; whether from the retina, and not from the choroidal pigment, experience has not yet decided."

In 1810, Prévost, in the *Bibliothèque Britannique*, Vol. 45, published his researches on this interesting subject, of the illuminating of animals' eyes, and by observations on living cats, disproved the phosphorescence theory. He finally showed that the illumination of the cat's eye, as well as of other animals, exhibiting the same phenomenon, was due not to phosphorescence, but to the reflection back of the rays of light, which entered the pupil, and therefore was neither dependent on the animal's will, or its state of excitement; that it also did not appear in complete or very great darkness, and that it could in no manner assist the animal in finding its way in the dark.

It was not till 1846, that Cumming, in the 29th vol. of the *Medico-chirurgical Transactions*, explained the pupils lighting up, and showed how it could be readily done. He said: Let a person stand some ten or twelve feet from a gas, or other bright light, the rays from which must fall directly on his face in the line he is looking. A screen placed half way between him and the light, casts off all rays except those coming to the eye. Now, if much light is reflected from the pupil, it will be seen at any point between the lamp and shade. Soon afterwards, Brucke, entirely independent of Cumming, showed how to illuminate the pupil, thus: a person sits in a dark room a few feet from a bright lamp, and looks just over and by it. On the other side of the lamp close to it is a screen, reaching high enough to simply cover the flame. Let any observer, also on the other side, look over the edge of the screen towards the eye of the person observed, and the latter's pupil will

be seen bright colored. The relative positions are thus: A, is the person observed, L, the lamp which should be at the height of his eye, S, is the screen to keep the light from B's eye, who looks into A's pupil just over the edge of the screen.



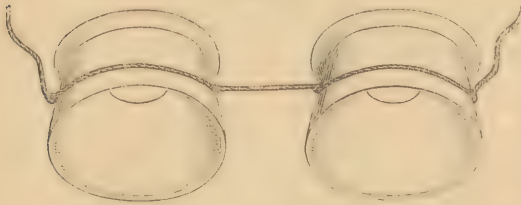
We have thus followed out the history of this interesting subject. It will be seen how the natural phenomena were studied, and how gradually truth came to light. So far, however, it will be noticed that we only found

that it was the light entering the eye, which, reflected back, made the pupil light up, and this light was of course of the color of the surface which reflected. This would have been of no special value to the ophthalmic surgeon without further discovery. We need to see the details of the structures within the globe to be able to decide if they are diseased; or, if some foreign body has entered the eyeball, we must see it clearly to decide what it is, and whether it may be removed, etc. Now the optic nerve, when it enters the eyeball, is a pale yellowish white disk, or a pinkish red, and the blood vessels of the retina which enter in the centre of this disk, spread out from these in beautiful ramifications, all of which are perfectly distinct and clear under the wonderful ophthalmoscope.

History of Sight Restoring Inventions.

BEAR with us a moment while we advert to the instruments which have been most extensively sold during the last quarter of a century in the United States and Canadas, and, more or less, throughout the civilized world.

Fig. A.



A patent was obtained April 22d, 1851, for the first sight-restoring invention. It consisted of a pair of Eye Bowls turned out on the inside so as to shape the eye.

These were connected by a wire or cord so that they could be applied to the eyes the same as a pair of spectacles, as seen in Fig. A. The directions for their use was simply to tie the cord around the head, so as to press the bowls upon the eye-balls, after the manner of J. Quincy Adams' invention. The frequent application of this pressure would cause the oblong or flattened eyeball to conform and grow to the interior form of the bowl.

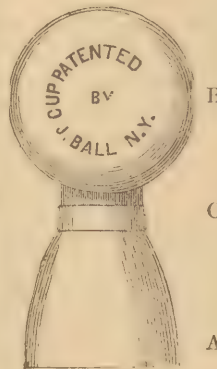
Many cures were effected by its use, but the great objection was that the eye was not braced or supported while undergoing this pressure, and no uniformity of action could be obtained. Great fatigue followed their use.

In 1858 a Mr. J. Ball, of Elmira, N. Y., made an improvement, as he thought, on the above, and called it an Eye Cup, represented by Figure 9.

It was applied by compressing the rubber ball between the fingers, placing the cup on one eye, and then allowing the ball to dilate so as to produce suction. The interior of the cup had only a conical bevel, which terminated in a cylindrical chamber, leaving a sharp edge at the termination of the conical bevel.

On some eyes it worked tolerably well. Testimonials were received from Prof. Finney, of Oberlin College, and many others who were benefitted by its use. But

Fig. 9.



- A is simply a wooden or ivory cup.
- B a common rubber ball.
- C a brass ring holding them together.

like all new inventions, it had many imperfections. Its demerits, according to the united judgment of the profession, have been published in a pamphlet issued by Dr. E. B. Foote, of New York City. It is as follows:

FIRST:—It was not altogether safe for all eyes, because if the eye was small enough to pass the bevel, it was liable to impinge on the inner abrupt edge, causing congestion of the eye, just as the end of the finger will become congested with blood when a string is drawn tightly around it.

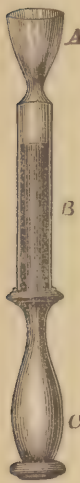
SECOND:—There was NO UNIFORMITY in the EXPANSIVE POWER of the RUBBER BALLS, some being too elastic and others too in-elastic. It would be a difficult matter to manufacture such balls, and have them possess uniform elasticity; hence, while one would not expand forcibly enough to give the requisite suction, another would expand too forcibly, giving a sudden and wrenching suction, much to the discomfort, if not injury of the user.

THIRD:—The difference in the expansive power of the balls necessarily rendered the effects produced on the eyes unequal, for they were sold in pairs, with directions for their application to both eyes at a time. One instrument would have been better, with directions to ap-

ply to the eyes alternately, but in that case the invention was open to the first and second objections.*

The first EYE-SHARPENER, so-called, was the invention of a professional gentleman in Ohio, who, finding his eyesight rapidly failing, set himself to work to devise some means for restoring the convexity of his eyes. He had not heard of the instruments referred to in the foregoing criticism, but knowing the cause of his failing

FIG. 10.



vision, he determined to overcome the defect. In his extremity, he devised an instrument like figure 10. In this illustration, A, represents a conical cup, having a conical form *inside*, as well as out, which is so placed over the closed eye in its application, that the ball of the eye is pressed on its sides. B is an air chamber, connected by an orifice through the neck with the conical cup. C is an air-tight piston, which may be withdrawn to exhaust the air, and thereby induce the pressure upon the sides of the eye within the cup. With this instrument the inventor entirely overcame his optical defect, and was enabled to throw aside spectacles, which he had worn for many years. Elated with the success of his discovery, he applied for and received a patent, and intrusted its manufacture and sale to a medical gentleman of his acquaintance, who shortly after died.

The inventor being actively engaged in his own profession, this useful instrument dropped into oblivion. The pressure could not only be graduated at the will of the user, but the conical form of the entire interior of the cup, from its outer edge to the extremity, gave it precisely the right shape to impart convexity to the cornea without the least danger to the eye. Dr. Foote says he sold many of these, and they gave excellent satisfaction, excepting in one or two respects—they were of glass and easily broken; it was difficult to obtain in all instruments an entire exhaustion of air from the cup by the withdrawal of the piston, as the glass tubing would be sometimes a little tapering, or the cushion of the piston imperfect. If perfect at the outset, the cushion would in time become worn, and in the hands of a person not ingenious enough to repair it, the instrument would become useless. We might add that they were also open to the objection growing out of the necessity of operating upon only one eye at a time, and in the hands of an unskillful person, if the piston was drawn too suddenly, there was danger of sucking or drawing the eye from its socket.

We pass to the next instrument put before the public.

It was, however, of the same form and description as Ball's, but nothing like so good. It was the poorest kind of a six-penny India-rubber ball, attached to a wooden cup. It was called Dr. J. — & Co.'s Patent Cornea Restorer and Cornea Flattener. This instrument was of no merit, as the following letter received will testify:

* But if an instrument could be constructed to exert the same pressure SIMULTANEOUSLY on the two eyes, the desideratum would be gained. A fortune awaits the inventor of such an instrument.

SHINGLE CREEK,
St. Lawrence Co., N. Y.

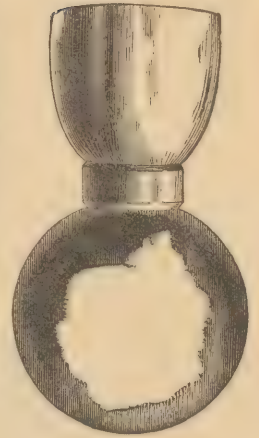
DEAR SIR:—I have seen your circular which you sent Wm. Lamb, on the cure of near-sightedness, and would like to try your remedy, although I have just been trying a pair of Dr. J. S. & Co.'s Patent Cornea Flatteners, and have not received any benefit. They cost me \$7.50. I was completely humbugged out of my money. I will willingly pay to you ten times the cost of your Duplex Restorers if they will make me see half as well as a person who is not near-sighted.

Yours,

MARTIN L. KINNEY.

August 28th, 1868.

FIG. 11.



Next appeared a Dr. Winslow, of Rochester, N. Y., with an improvement on the Eye Cup. He invented what is called the "Improved Eye Sharpener." Dr. Foote, of New York, looked upon it as combining the good qualities of the

FIG. 12.

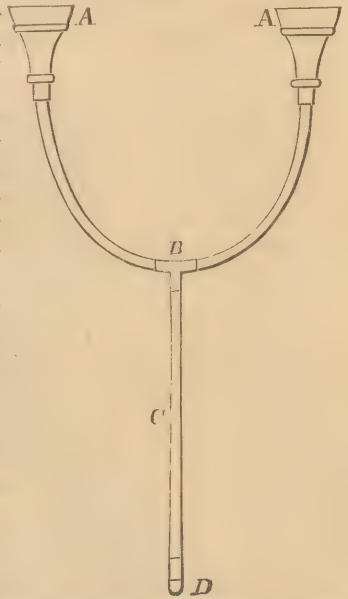


Figure 12, represents what is known as "Dr. Foote's Improved Eye Sharpener."

A A, are cups of cocoa-wood, made in form interiorly like the cup A, in figure 10. These cups are connected by the rubber tube B, while

C is another rubber tube, connecting with B at one end, and terminating with a metallic mouth-piece, D, at the other. These cups were placed over both eyes at one and the same time.

The suction was produced by drawing the air from the end of the tube D placed into the mouth.

This instrument is certainly better than either of the others before-mentioned, but the practical means employed to work it is too filthy and disgusting for a lady or gentleman of education and refinement to consider for a moment. The principle is correct, but the practical operation causes a flow into the mouth of the nasty fluids and other excrementitious matter that discharges from the eyes whenever exercised. For this and other good reasons it was lately abandoned.

We have now seen that instruments such as Eye-cups, Cornea Restorers, Cornea Flatteners, Eye-Sharp-

eners, and Improved Eye Sharpeners have heretofore been made to restore the shape of the eye by atmospheric suction, so that the sight might be improved; but as the said instruments have been used singly, or disconnected from each other, a person was apt to INJURE THE EQUALITY OF STRENGTH IN THE EYE, rendering one eye stronger and more far-sighted than the other, in consequence of their being applied more to one eye than to the other, or else under different atmospheric pressure. Like all new inventions they were rude and imperfect, either defective in construction or unequal in action and wrong in principle.

Evidently the correct principle was not to be made known to men UNACQUAINTED with the construction, anatomy and physiology of that wonderfully delicate and most beautiful organ, the EYE.

John Quincy Adams was the first man that understood the cause of decay of vision, and he practiced upon himself his remedy for preserving EYE-SIGHT TO OLD AGE. Humanity must thank him for the idea. We feel proud to have it recorded that we have worked out his idea. We have improved on every other invention, and have discovered what all have been seeking for—a durable instrument, at once easily controlled and graduated, that would give the same degree of atmospheric pressure, or suction, simultaneous

FIG. 13.

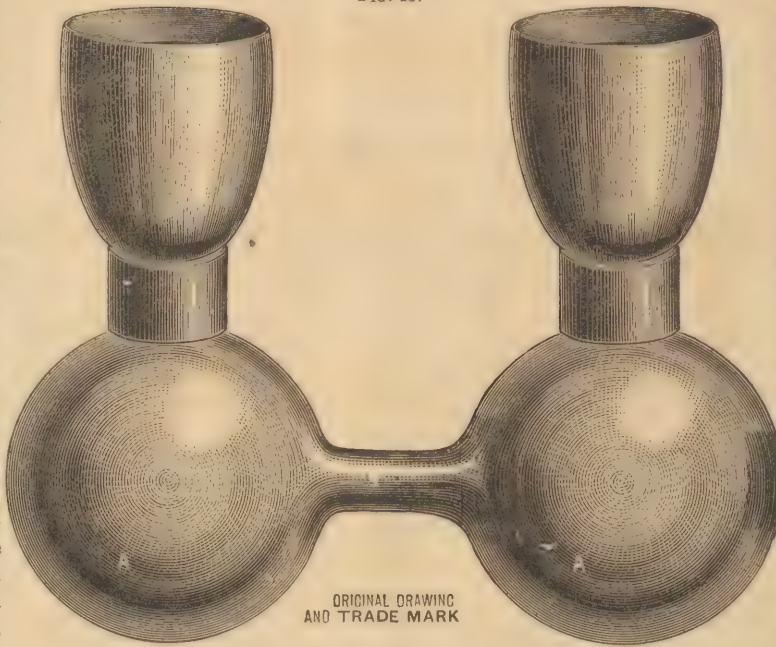
ORIGINAL DRAWING
AND TRADE MARK

FIG. 14.

ORIGINAL DRAWING
AND TRADE MARK

around and upon BOTH EYES. It is called the Duplex Eye Bowl, or Duplex Eye-Sight Restorer. It consists of a pair of eye-bowls connected to an exhaustion ball by means of air-tubes, so that when applied the same atmospheric pressure will, at all times, be exerted simultaneously upon the two eyes. Great strength to the eyes, and a uniform improvement in the sight is GUARANTEED by their use.

Fig. 13.—Represents the Duplex Eye-Sight Restorer in full proportion. It is recommended for restoring permanently the flattened Cornea, or Eyeball, to the proper convexity, so that spectacles need never more be worn.

Fig. 14.—Represents a sectional view, showing with great distinctness the interior construction of the Semi-circle Myopic attachments for the cure of nearsightedness.

C C, D, represent the bowls of Lignum-Vitæ, Hard rubber or Ivory of precisely the right shape best adapted to give a spherical form to the eye when the eyeball is too long or nearsighted. The screw necks of these bowls pass into the hollow necks or tubes of the exhaustion ball or balls. A A, or A B—where they are securely held. A A, or A B, are the Para rubber balls. A slight compression of either one of the balls expels the atmosphere, and their expansion produces the suction required for the bowls in their action on the eyes, thus insuring uniformity of pressure and action throughout the apparatus.

B—Is the Para-rubber ball cut down the middle so as to show a sectional view of the same as well as to expose the interior arrangement called the Semi-circle Myopic Attachment, D.

The Para India-rubber balls are something entirely new. They will last a life time. Years of use will not weaken them.

General Directions for Using the Patent Duplex Eye-Sight Restorer or Eye-Bowls.

1st. Wash the eyes in cool water or in a weak decoction of cool black tea. Never dry the eyes with a towel. Having the eyes and lids wet, close them gently; in so doing don't contract the muscles around the eye, but rather elevate the eye-brows, keeping the eye-lids closed, so as to have a smooth surface on which to place the eye-bowls. Hold the head erect. After pressing a portion of the air from one or two balls with the finger ends, using both hands, raise the Restorer to the eye-lids. Place the bowls simply against the eyes, fixing them centrally and horizontally. Now allow the balls to expand by lessening the pressure of the fingers, and depend upon it the suction will hold them on. Do not, however, remove the fingers or in any case allow the suction to draw hard enough to cause the least pain, but rather at intervals exercise the eye again and again, according as you can bear.

To remove the eye-bowls from the eyes, press the balls. Never pull them off.

It is always best to apply the bowls just before retiring, or after the light has been lowered.

Some, however, use them by day. A celebrated architect writes us that, he has used them since 1867, not to restore his sight, for that is good enough, "but," says he, "I experience after several hours of brain-work or close attention at ruling fine lines or executing ornamental work, that my eyes become wearied and my head aches so that I can scarcely distinguish one line from another. At such times I reach for my Duplex Eye-Bowls, I then tilt back in my chair, adjust them for one or two minutes, and experience a peculiarly soothing and restoring sensation throughout my head. This delightful feeling always accompanies their use. In two minutes' time I feel as fresh as in the morning, and again resume work with renewed vision and vigor. I can recommend them as a boon-companion to architects, accountants, book-keepers, and others who tax their eyes beyond their natural strength."

2d. For *Intractable Amblyopia*, or *Dullness of Vision*; *Presbyopia*, or *Long-Sightedness*; *Asthenopia*, or *Weak-eyes*; *Ephiphora*; *Running* or *Watery Eyes*. The first two weeks use the bowls from one to two minutes every night, then for a fortnight from two and a half to five minutes every other night, when the eyes will have become sufficiently strong to receive them from five to eight minutes twice a week for one month. Then, unless it is an extremely hopeless case, you will think of laying aside your spectacles forever.

3d. For *Ophthalmia*; *Inflammation of the Eye and its Appendages*; *Amaurosis*, or *Partial Blindness*; *Weakness of the Retina and Optic Nerve*. First—remember before using, to wet the eyes with a weak decoction of cool black tea, and while wet apply the Restorer but half a moment every other night for a fortnight. Then increase the time gradually, as above, until strength and sight are strong.

Occasionally. For all diseases of the eyes, but more especially in cases of inflammation, burning, itching, sore or ulcered, and weak eyes, apply the bowls **WET** as follows:

Half fill the eye-bowls with cool, weak, glycerinated tea water, incline the head forward over the basin, and apply them. The bowls draw much harder when containing the fluid. The fluid allays all inflammation and redness, and will be found exceedingly refreshing.

Glycerinated tea water, if made carefully, is worth all the eye-washes, salves, and lotions in the land. To make it steep one-half teaspoonful of black tea, one minute only in one-half pint of water; add one table-spoonful of glycerine; strain it, and when cool use it. Five or ten cents worth of glycerine will last a year.

4th. *Photophobia*, or *Intolerance of Light*; *Ptosis*, or *Drooping or Falling of the Eye-lids*; *Pain in the Eye-Balls*; *Sore Eyes*; and all kinds of *ulceration* and frequent passage of floating flecks or spots before the eyes. In these cases you must move cautiously but expeditiously (a good purging is the first best thing you can do). It must be an unirritating purgative. "Hygienic Messengers" as the safest and best. If you cannot get them at your druggist we will send them to you.

Wash the eyes night and morning always before eating, *never after eating*, with cool water or cool black-tea water. Tea water for the eyes must not be made strong. Draw the tea only one minute; then pour off the water into another vessel, as you strain it, to get cool.

At night apply the Duplex-bowls, allowing them to draw but slightly, and then to take from the eye quite slowly. Do this from one-half to one minute each night the first week, then two minutes the second week; then stop one week. Now do all you can to forget your spectacles, and use your naked eye for reading or writing. Then apply the Restorer three to four minutes every other night for a fortnight. As your eyes grow stronger, apply them two or three times a week until restored.

5th. For *Short or Near-Sightedness*. The same general directions are to be followed. In all cases the SEMI-CIRCLE MYOPIC ATTACHMENTS must be used in connection with the Duplex Restorer. See Fig. 14.

Use them as the strength of the eye will bear; say one to two minutes every other night for the first week. The same time every night the second week. The third week increase the time to from two to four minutes, and so on. The stronger your eyes become, the less inclination you will have to use glasses. Use the glycerinated tea-water, as described above, whenever inflammation or soreness is present.

In all cases when physic is needful, take it. Turkey Rhubarb is a safe and excellent purgative, but you will find that the Hygienic Messengers are the only uniritating cathartic. They do not gripe; are mild in action, and free from any debilitating effects. They are made with special reference to the eyes, and are acted upon by those absorbents which bear in connection with the bowels the greatest sympathy for the eyes.

The "Messengers" are taken at night. We honestly recommend every person, using the Duplex Bowls or not, to rejuvenate the system with the "Hygienic Messengers." Mailed free, 50 cents a box.

Their action relieves the headache at once; makes the eye clear and bright, and gives vigor and tone to the whole system. They should be used by every family as a preventative and cure for every ill that flesh is heir to. We have so great faith in them for general use that we declare they should be used by every family in the land.

We can safely promise a permanent cure of the eye-sight when the system is given the correct *tone* while the eyes are being exercised with the Duplex Eye-Sight Restorers.

CAUTION.—We particularly caution all persons against the indiscriminate use of towels. Whole families have been inoculated with sore or diseased eyes from use of the same basin or towel.

Secondary cases are oftentimes severest, because the virus or morbid poison thus brought into the system usually entails a complication of diseases. Any disease if too long neglected becomes chronic in character. The best advice and surest remedies should at once be procured by those who value life and health more than money.

There is this difference between these two temporal blessings—health and money; money is the most envied, but the least enjoyed; health is most enjoyed, but the least envied; and this superiority of the latter is still more obvious when we reflect that the poorest man would not part with health for money, but that the richest would gladly part with all their money for health.

INJURIES OF THE EYEBALL.



TAKE a single fold of cotton or linen, wet with cold water and lay it over the eye, it is all that is needed till skilful help can be obtained. Let us here emphatically warn you never to put an "eyestone" in the eye to remove a foreign sub-

stance, notwithstanding you may find them for sale in some of our so-called respectable apothecary shops.

Some sudden violent exertion, sneezing, coughing, a blow, etc., may cause an effusion of blood under the delicate membrane covering the eye-ball, and change the white of the eye to a blood-red, giving rise to anxiety. Such an effusion, if it is only this, is of no consequence, as the blood becomes absorbed in a few days. Cold water is the only application which should be made. Poultices, spirit and water, arnica, quack medicines, etc., only retard nature's cure, and may do irreparable mischief. The only treatment for all these forms of injury, till proper advice can be obtained, is a rag wet with cold water laid over the eye, with, of course, rest and quiet on the sofa, or bed, and avoidance of light and use of the eye. Blows and cuts may produce bleeding within the eye-ball, even when this is not apparently much, if any, injured.

Simple puncture of the clear part of the eye, or cornea, when caused by a fine sharp instrument such as a needle, rarely does much harm in the end, although all such wounds need the best of care for a short time.

If some one of the various "eye waters" constantly offered for sale in the apothecaries' shops together with other quack medicines, is used when the cornea has been scratched or bruised, there is pretty sure to result a permanent white spot; *not a scar*, but a deposit of sugar of lead, which these quack eye waters generally contain. This film, or deposit, can rarely be removed by the surgeon; and, of course, in proportion to its extent, produces more or less blindness.

The most dangerous thing which can happen to the eye, is the lodgment of some foreign body within it. Among all classes of mechanics, such injuries are constantly occurring, from chips of metal flying off from the instruments they are using, or the work on which they are employed. If it has merely a cut in the eyeball, and dropped back out of the eye, the patient may escape with perfect vision; but if it, no matter how small, has entered the eyeball, there is not one chance in a million of the eye's being saved, and an even chance whether the other eye is not also lost, from what is also called sympathetic inflammation attacking it. Even if the sound eye has not been previously, in some of these outbursts of inflammation in the stump, this insidious and dangerous sympathetic trouble comes on; taking at first the form of *weakness*, inability to bear the light, slight pain and discomfort. These symptoms increase in severity, and a gradual change takes place,—the eye degenerating and sight being lost. The only remedy for such sympathetic inflammation, is the removal of the cause, namely, the eye, or the stump, with the foreign body in it. This, if done too late, may not save the second eye. *An eye with a foreign substance within the eye-ball, never should be allowed to remain.*"—Dr. Jeffries.

CAUTION.—No two persons ought to think of using the same Eye Restorer, if either has any symptom of diseased eyes, for the minutest speck of the secretion coming in contact with the sound eye of another person, will excite the same disease in it. Isolation of the cases, absolute cleanliness, careful destruction of all rags, etc., are indispensable.

An argand gas-burner with a blue chimney, petroleum or oil lamps, moderators, etc., are all good enough lights, if we have *enough light* from them coming in the right direction. All light on our work, whether artificial or sunlight, should come from one side, and not be reflected by the paper or book before us into the eye. When the eyes are *weak* there is a *reason* for it, and good advice should be sought at once. Don't try to find this from advertising quack oculists, or travelling spectacle sellers. All sorts of goggles are, as a general thing, hurtful to the eyes, and never should be brought or worn without advice. Smoked glasses, and green, do not give the needed protection, ease, or rest to the eye. The proper color is cobalt blue. All spectacle glasses are now manufactured of several shades of this color, which have a definite effect on the sun's spectrum, and alters the character of the light which comes to the retina, thereby stimulating us to give what we call sight. This fact has but recently been discovered, and hence it is that one sees a few people going about with blue glasses.

STYES.

For the cure of styes on the lids, get some one to pull out the hair in the centre of the sty or sore, which you will find festered, and the swelling will go down in less than twenty-four hours. One troubled much with them is in need of more changing exercise of the eyes. The Duplex Eye Exercises will drive styes away and strengthen the eyes.

OPHTHALMY.

One of the most considerable disorders to which the human body is liable is INFLAMMATION. Its influence is direct and immediate in obstructing the natural action of the parts affected by it; in no case is this more evident than in *Ophthalmia* or *Inflammation of the Eyes*. In any stage it impairs Sight, and in many instances may rise to such a height as to effectually destroy it.

Of whatever degree the Inflammation may be, as a general thing, it will be found that *light* is offensive to the eye, and persons laboring under this complaint are incessantly closing or squinting their eyes.

Extraneous bodies entangled in the eye are a common cause of Inflammation. These occasion great pain and inability to move the lids. They also excite an additional secretion of tears, which alone oftentimes is sufficient to remove them. If this, however, fail, cause the patient to look toward the side opposite to that in which the foreign substance lies, the lids of the eye being at the same time held open by the fingers, a piece of wet lint on the point of a probe is the best to remove it (an unskillful hand might wound the CORNEA and leave a scar to impede the sight); or, drawing the eyelid down and outward, let the person blow that side of the nose violently while his finger closes the other nose passage.

Anything in the shape of bandages, plaisters, etc., over the eyes, confine the tears and add to the irritation. We would recommend a pasteboard hood, or bonnet to be worn as near the eyes as the case will justify.

When the pains are acute, darting through the eye to the back part of the head, whether caused from excess of light or of inflammation—such sensations always indicate much danger of loss of sight.

Soon after the more violent symptoms are abated, the patient imagines he sees black specks or points before him. It is a frequent forerunner of the Gutta Serena and renders a fixed state of the Iris, rendering it impossible to contract or dilate.

BLEEDING is the oculists, remedy usually resorted to in cases of OPTHALMY, five or six leeches are applied to the temples or lower eye-lids, producing long discoloration of the skin.

Eight or ten ounces of blood have been taken from the vein that passes on the side of the nose near the inner angle of the eye-lids. The external jugular vein is oftentimes opened for this complaint.

Scraping of the Conjunctiva with a brush of barley-beards, scarifying the inside of the lids, with a lancet, or cutting off a portion of the swelling of the everted lids with a pair of curved scissors, is oftentimes advised by oculists of the present day.

Surgical operations, or whatever tends to increase irritation, promotes inflammation, and an unsuccessful operation oftentimes results in total loss of sight.

The Duplex Eye-sight Restorer, or Eye-Bowls, cause a sympathizing flow of the aqueous, crystalline and vitreous humors in both eyes simultaneously with a uniformity of action and equal atmospheric pressure on the globes of the eyes. In most cases they allay at once all inflammation, and so increase the strength, toughness, and elasticity of the membranes of the eyes as to restore the requisite focal power immediately.

Both before and after using the Duplex Restorer use cool glycerinated tea-water, made as directed on page 25, around the eye and under the eyelids, always remembering to let them dry natural.

It is well known that *there exists a close sympathy between the eyes and the bowels*. Hippocrates said that diarrhoea was a cure for Ophthalmia. *A mild purgative with the use of the Duplex Bowls will cure the worst diseases of the eye.*

The "Hygienic Vegetable Messengers" are the only safe and proper purgative to use for Ophthalmia, weak, red, sore, or ulcered eyes. To those purchasing the Eye-Bowls, we send free a sample of five Hygienic Messengers, together with our recipe for the very best eye-water known for strengthening, healing, and immediately subduing all pain and inflammation. You can make it yourself at a cost of not more than ten cents per pint.

AMAUROSIS.

AMAUROSIS is a word often used to denote about all the diseases of the eye where, as has been wittily said, the patient saw nothing, and the surgeon also. The ophthalmoscope, by revealing to us the interior of the eye, and hence the causes of almost all blindness, enables us to distinguish between one and another.

Amaurosis is paralysis of the retina and optic nerve. Sometimes it presents itself in the most obstinate form. The most common cause is tobacco-smoking. We copy from the New York Observer, the following :

AMAUROSIS CAUSED BY TOBACCO SMOKING.—A paper on Amaurosis from tobacco smoking was lately read before the Medico-Chirurgical Society in England, by Mr. Hutchinson. The author adduces evidence to prove that the form of nervous blindness, known by the name of amaurosis, is frequently produced by excess in tobacco smoking. Of the thirty-seven cases which Mr. Hutchinson recorded thirty-one were smokers. The history of the patients and the most successful mode of treatment led Mr. Hutchinson to the following conclusions: 1. Among men, this peculiar form of amaurosis (primary white atrophy of the optic nerve) is rarely met, except among smokers. 2. Most of its subjects have been heavy smokers—half an ounce to an ounce a day. 3. It is not associated with any other affection of the nervous system. 4. Amongst the measures of treatment, the prohibition of tobacco ranks first in importance. 5. The circumstantial evidence tending to connect the disease with the use of tobacco as a cause, deserves the serious attention of the profession.

This disease can be cured by our Duplex Restorers, because all that is required of us is to supply the deficiency. Our Duplex Restorers quicken the circulation of the aqueous, vitreous, and crystalline humors, and stimulate the optic nerve in both eyes simultaneously. But if the old style of an Eye Cup is used the action will be rendered unequal, and the amaurosis will assume its worst form, and if long practiced, may result in total blindness.

The Duplex Eye-sight Restorer is the only known remedy. It exerts an equal pressure simultaneously on both eyes.

OVER-SIGHTEDNESS AND SQUINTING EYES.



THE discoveries of Prof. Donders, in reference to over-sightedness, have naturally caused ophthalmic surgeons, all over the world, to study the cases presented to them, and there is an universal agreement as to the effects of hypermetropia. As a distinguished London oculist, Dr. Wells, truthfully says: "Hypermetropia, or over-sightedness, is very frequently the cause of, asthenopia, or *weak sight*. It is distinguished by the following symptoms: The patient cannot continue to regard near objects for any length of time, as in reading, writing, etc., without the eyes becoming fatigued. The print becomes confused and indistinct, the letters run into each other; there is a feeling of tension and pain about the eye and over the eyebrow, which, if the work is persisted in, soon becomes more intense, and sometimes even assumes the character of headache (which is often mistaken for nervous headache, or migraine); the eye at the same time, becomes watery, red, and feels hot and uncomfortable. Yet there is nothing in the appearance of the eye to warrant this state of things. It looks perfectly normal, the refracting media are clear, vision is good, the convergence of the optic axes perfect, the mobility of the eye unimpaired. Neither does the ophthalmoscope reveal anything abnormal, except, perhaps, a slight state of congestion of the retina and choroid.

And yet the eye is perfectly useless for continued work at near objects, for reading, writing, sewing, engraving, etc.; for symptoms of weak sight, or asthenopia, soon show themselves, and the work has to be laid aside. Then these symptoms quickly vanish, and the occupation can be resumed until their reappearance again necessitates an interval of rest; the longer this is, the longer will the person be able to re-continue his employment.

It has been thought that asthenopia might be cured by gradually accustoming the eye to weaker and weaker glasses, so as finally to render their use altogether superfluous. But the reader will now understand how just the contrary proceeding is necessary in hypermetropia. If we wish permanently to cure the patient, we must prevent all undue straining of his accommodation, and this can only be done by the proper use of the Duplex Exercisers. Asthenopia is, in a great majority of cases, due to over-sightedness; and those patients who under any other course of treatment, haunt our out-patient rooms for months and years without relief may be speedily and permanently cured by the proper treatment, of their hypermetropia. Let us but consider the crowd of seamstresses, watchmakers, engravers, etc., who are rendered incapable of following their employment, whose future is starvation if this fact is not attended to."

Whenever an eye turns in or out, away from its fellow, and the retinal image is consequently suppressed, *the power of sight begins to fail in the eye, and goes on decreasing till it is almost blind, or can only distinguish large objects.*

The community generally, and often physicians also, are apt to attribute squinting to all sort of causes, frequently, in fact, to anything which is sufficiently prominent in a child's life to have especially attracted the attention of the parents or attendants. Diseases and injuries of the brain may sometimes produce squint. Squinting may be acquired by a child imitating another whose eyes are turned. A trick of looking at the nose may produce it, as also many repeated attempts to see how near an object can be brought to the face and still be seen, played as a "game" in some schools. Paralysis of any ocular muscle, from injury or disease, may cause squinting. An opaque spot on the cornea may induce the eye to turn in or out, in order to allow the light to pass by it to the pupil.

The two most frequent forms of squinting, namely, simply *converging* and *diverging*, are due to very different causes than the above. Probably eighty per cent. of all cases of converging squint are caused by over-sightedness, or *hypermetropia*, as it is technically called. It arises from the eyeball being too short from before backwards, so that rays of light cannot be properly focused on the retina without an excessive strain on the muscular power in the eye, which enables us to adjust it for near objects. It is relieved by a convex glass placed before the eye. A child even at seven to ten years of age, who is over-sighted, may require the spectacles which his father, or perhaps grandfather, uses. When we look at near objects we converge the eyes, of course, and with this act is intimately associated this power of adjustment. The more we turn the eyes in, the more we can adjust them for near objects, or accom-

modate, as it is called. The over-sighted person must accommodate strongly; therefore he lets one eye turn in further than the other, i. e., he squints. This would make him see double, and to obviate that, he suppresses the image in the squinting eye. The moment this happens the squinting eye begins to lose its power of sight, which, as we have said, may increase to almost total blindness. Squinting from over-sightedness may be cured, in any stage, by exercising the eye with the Duplex Eye-Sight Restorer.

CATARACT.



HE crystalline lens in the human eye is contained in a sort of envelope or capsule. The edge of the pupil, or rather the inner edge of the iris, lies against this capsule. Now, when the iris, as is very frequently the case, becomes inflamed, lymph is exuded from the iris on to the capsule of the lens in the pupil. This lymph becomes organized into film or membrane, and as it of course stops the rays of light from entering the pupil, it was called, in early times, "spurious cataract." By cataract now-a-days is always meant opacity of the crystalline lens itself.

What, now, are the causes of cataract? Some we know very well, but others are quite shrouded in obscurity. Injuries of the eye produce cataract. The lens will become opaque when a jar or shake, as from a railroad accident, or a blow on or near the eye, has caused the suspensory ligament of the lens to be broken so that it is detached. Any puncture of the lens, even the slightest, from needle, pin, glass, piece of steel, splinter of wood, fragment of percussion cap, broken spectacle frame, *etcetera*, any of these, or the many other foreign substances liable to enter the eyeball, may cause opacity of the lens, or what we call *traumatic cataract*, to distinguish it from that arising without direct cause.

As a matter of course, all the various diseases affecting the inner coatings of the eye may finally lead to the formation of cataract by the nutrition of the lens being interfered with. The deposits of lymph organizing into membranes in the pupil may lead to cataract in a similar way. As a general rule, however, cataract is a disease of old age, the lens becoming gradually opaque from deficient nutrition, and inadequate blood-supply causing diminution of the watery constituents of the lens. Cataract may also be congenial, as we have previously described in explaining how it may then be mistaken for near-sightedness. Cataracts may vary in color from a milky white to a jet black. When of this latter color, the pupil will of course look black, as naturally, and hence the person supposed not to be suffering from this disease. Sometimes cataracts, as in young persons, are perfectly soft, like jelly or sago; and sometimes, as in old people, as hard as wax or glue, or even containing chalky concretions.

The symptoms of commencing cataract are a slowly increasing diffused mist, thin cloud, or gauze intervening before the eye and external objects. The cataractous person generally also sees better sideways than straight

forward. In twilight or partial daylight, the person will see better by the pupil's dilating more from the absence of the stimulus of light. A candle or street lamp seems expanded out into a larger flame. Objects like the moon are often seen multiplied. This description will perhaps enable the laity to judge somewhat whether a person has cataract. By dilating the pupil with atropine, and examining with the ophthalmoscopic mirror, will, of course, decide the point instantaneously.

Xenophon, in his *Anabasis*, so familiar to schoolboys studying Greek, relates that Cyrus sent one of his generals to Egypt to be operated on for cataract by the ophthalmic surgeons there.

The precise method now very generally adopted, is that of the late lamented Prof. Græfe, of Berlin, who stood at the head of ophthalmic surgery. It is the following: A narrow delicate knife is passed through the sclerotic so as to transfix the eyeball in front of the iris, and made to cut its way out, leaving a wound large enough for the cataract to come through. A piece of the iris is removed with delicate forceps, and the capsule of the lens punctured so as to allow the cataract to escape through the wound, which is accomplished by delicate pressure with an appropriate instrument. The eyes are then both most carefully bandaged, to prevent movement of the eyeballs, and the patient kept in a recumbent position from three to six or eight days. Two weeks or more is required before the patient can travel to return home, if he live at a distance. By that time the eyes can be tested for cataract glasses, and of these they will need one pair for looking at distant objects, or to go about with, and another pair to read or sew with. So, after the surgical operation, two pairs of glasses are needful through life, whereas the Duplex Eye-sight Restorers cure the disease at once, in nine cases out of ten, and the patient need NEVER more be troubled with spectacles.

NEAR-SIGHTEDNESS.*



CURIOUS work has been published at Breslau, giving the result of an examination of the eyes of ten thousand and sixty school children. The proportion of short sighted children was 17.1 per cent., or seventeen hundred and thirty among ten thousand and sixty. No village children were found to be short-sighted until they had been some time at school—at least half a year. There were in proportion four times as many short-sighted children in the town (Breslau) as in the country, and short-sightedness increased generally with the demands made upon the children. The author of the work attributes the evil, in a great measure, to the bad construction of school benches, which force the children to read with their books close before their eyes, and with their heads held downwards.

Many of the leading opticians of the present day agree that Presbyopic and Myopic (long-sighted and short-sighted) conditions of the eye are not the result of

* We refer the reader to remarks on pages 12 and 13

organic changes of *form*, either in the cornea or crystalline lens, but purely *functional diseases*, the prime cause being a debilitated condition of certain portions of the iris and ciliary body.

The eye may be natural as regards its optical form, and yet vision be performed imperfectly. The cornea and front portion of the eye be increased in convexity, and yet the patient may be far or near-sighted, or he may have a natural sight; the same is true as regards the eye of the flattened cornea.

The power by which the eye is enabled to adjust itself to different focal distances is a muscular power, and is subject to the general law of muscular action. The focal character of the eye is determined by education and habit, precisely as the condition and power of any portion of the muscular system is thus determined; in fine, the eye is educated to any new action or calling.

Experience and observation demonstrate the fact that by exercising the muscles in a certain direction they acquire great strength and intensity when called to labor in that direction.

Let us cite the fact that the chamois and deer hunter returns from his lengthened chase far-sighted. The sailor is enabled to descry a ship at a great distance, hours before a landsman can perceive that there is anything before him or around him but the wide ocean, hemmed in by the cold grey sky.

It is an exception to meet an old sailor near-sighted. From the masthead they are continually straining their eyes in the attempt to see objects in the distance. The jolly old tar will descry vessels at a distance that completely astonishes the landsman.

The cause assigned for a Presbyopic condition is that man exercises the muscles which adjust the eye to long focal distances in the common pursuits of life, more than those which adjust the eye to short focal distances, and, consequently, at about the age of forty he becomes what is usually denominated long-sighted. The student, engraver, miniature painter, watchmaker, etc., become Myopic for the same reason, *to wit*:—they train the eye to short focal distances, and hence become short-sighted. Other aberrations, such as double-sightedness and obliquity of vision may depend upon a debilitated condition of the iris, or a want of uniform contractility in the same.

All natural conditions of the eye are caused by a deficiency of vital power or failing strength to support the humors of the eye.

The philosophical explanation of the utility of the application of the Duplex Eye Sight Restorer is that it increases the circulation of the humors by exercising the eye, thereby introducing constantly into this nutritive fluid the constituents necessary to render the degenerated organ natural.

Inflammation, weakness, and extreme susceptibility of the eye to light, and the results of debilitated conditions, referring primarily to deficient circulation. The conducting vessels are constricted and the nerves paralyzed. Under this head may be classed iritis, amaurosis, amblyopia, etc.

It will be seen that the requisite treatment must be an increased and renewed circulation. Debilitated muscles must be revitalized and invigorated, the circulation in the capillary vessels controlled—in a word, the eye

and its adjuncts must be treated upon the principles of nutrition. This is accomplished by a prudent use of our Duplex Eye Sight Restorers. These Eye Exercisers have proved in public and private practice an inestimable blessing to thousands.

By their aid we claim to possess the power of so altering the condition of the eye, as to enable it to see near and distant objects with distinctness. We argue the necessity of this arrangement from the fact that a lens has a fixed focal distance, and its position must be changed in order to give a distinct image of objects at different distances. We are all familiar with the arrangement of the telescope and spy-glass, which are constructed with an adjusting apparatus for changing the position of the magnifying lens. The internal muscular action of the eye enables us to change the position of its lens, and adjust it to different distances.

Near-sightedness and far-sightedness are the result of the enfeebled condition of the internal muscular arrangement, which is caused by an unhealthy, impeded circulation, or the result of an obstructed and unhealthy state of the circulating system.

Our theory is perfectly philosophical and in accordance with the plainest principles of natural science and practice.

It is already several years since Prof. Donders unhesitatingly declared that a near-sighted eye was a diseased one. His studies of refraction and accommodation are now, so to speak, the classical literature of this specialty. Many purchase spectacles at the village clock-maker's, the village toy-shop, or of the travelling pedlar, and the peripatetic quack oculist! Naturally it will be a long time before our community learns that it is not a necessary part of every watch-maker or repairer's business to keep on hand and sell spectacles, which, according to his degree of honesty, or "brass," he advertises as "helps to read," or "restorers of sight," etc. "The amount of injury done by this special form of quackery is not generally known, but abundantly proved by the daily records of the eye hospitals of our larger cities. Oculist and optician are regarded as synonymous terms by nearly all classes of the community, and ophthalmic surgeons fail in their duty if they do not teach them that an ophthalmic surgeon alone can make a proper and correct examination of the human eye, and decide what glass, and whether any, should be worn by the patient, and the *optician's* business should be confined entirely to preparing and setting in a proper frame the glass directed by the former; exactly as an apothecary compounds and puts up the medicine prescribed by the physician."—*Jeffries*.

There are some popular delusions and mistakes to be noticed, here, in reference to near-sightedness, or *myopia*, as oculists call it. In the first place, a short-sighted person is congratulated that he will have good eyes in old age, and not need to wear glasses. This is a mistake; they will always have to wear glasses to see distinctly in the distance; if, however, they have been accustomed to wear spectacles, they will instinctively, as age comes on, push them up on to the forehead when eating their dinner, or, perhaps, reading, etc. Another fallacy is, that a near-sighted eye is always a strong one. Now there are many near-sighted persons, born so, who go through life wearing the appropriate glasses,

and using their eyes as freely, and with as little concern or consequence, as any other person. This may be called fixed myopia, and is hereditary—the girls generally following the mother, and the boys the father, as respects their sight. Where, however, near-sightedness comes on in youth and increases, or increases from birth, then it is a very serious trouble, and often leads to total blindness. The use of the eyes for near objects increases near-sightedness, which may be due to the bulging out of the back part of the eye-ball. Bending over the desk or piano is very bad for near-sighted people.

With appropriate glasses, many near-sighted or myopic people manage to get along in life about as well as other people; upon testing, however, they will be found not to have the same power of vision as those with normal eyes, at which they are often as much surprised as people are upon finding they are color-blind. What we want here to emphasize and dwell upon, however, is the fact that the number of strong and healthy eyes among myopic people is not as large as supposed, and improper glasses, improperly used, diminishes this number constantly. We said above, that the demands of present education increased the number of people with acquired myopia, or, in other words, impaired vision. This is well known, and recognized by every ophthalmic surgeon having an extensive practice among our highest educated communities. No one has yet, however, in this country, followed up a series of continued investigations, so as absolutely to prove it. Abroad, however, this has been done, and with the development of such startling data, that we give them here, since they must interest us all. Scientific research in this direction has lately been followed out so thoroughly, and with such important results, as to merit the attention of every one connected with the education of the young, as well as the special interest of the ophthalmic surgeon.

Dr. Cohn, of Breslau, has recently carefully examined the refractive condition of the eyes of 10,060 children, in the lower, middle, and upper schools of Breslau, and other places in Silesia. We should premise by saying, that he was induced to undertake this great task from finding, whilst at work on the statistics of some fifteen thousand patients of Prof. Foster's clinic, that out of 750 near-sighted people who presented themselves within four years, 400 had applied on account of severe trouble dependent on near-sightedness. Desirous of finding whether the refractive and other troubles of the eye were not induced by inadequate and improper light, badly-arranged and badly-planned school-desks, etc., he first examined the schools in Breslau, and, to avoid errors, afterwards those of other places in Silesia, not content till his lists contained over 10,000 records. His example is, fortunately, now being followed by competent observers in various parts of Germany.

Dr. Cohn chose 5 village schools, with 1,486 scholars, and 28 city schools, with 8,574 scholars; of these latter, 20 were elementary, 2 intermediate, 2 girls' high, 2 where languages and science were taught, and 2 upper high schools. Among the 10,000 children he found 1,730 with defective vision, making 17.1 per cent., the average number *increasing with the degree of demand upon the eyes at school*. In the city schools, there were

four times as many children with defective vision as in the country. With regard to sex—boys, 18.8, and girls, 14.3 per cent. The relation of defective vision to abnormal refraction is shown by the following table:

| | | |
|-------------------------------|--------------|--------------|
| Normal Eyes | 8,330 | 83 per cent. |
| Abnormal Refraction | 1,334 | 13 " " |
| Other Affections | 396 | 4 " " |
| | <hr/> 10,060 | <hr/> 100 |

Thus showing three times as many cases of abnormal refraction as other troubles with the eye in youth. Of these 1,334, one thousand and four were near-sighted. The following are deductions from his data in reference to near-sightedness: "1. No school was without myopic scholars. 2. The number varied greatly in the different schools. 3. In the village schools, very few (1.4 per cent). 4. In city schools, eight times as many (11.4 per cent). 5. In the city elementary schools, four to five times as many as in village (6.7 per cent). 6. Girls' high school more than the elementary (7.7 per cent). 7. In the city schools, there is a steady increase of the number of near-sighted children from the lower to the upper. 8. In the middle schools, one-tenth, and more; in the next above, one-fifth, and in the highest, more than one-fourth of the children are near-sighted. 9. The number of myopes varies in the different village schools, and also in the upper schools, the greatest variation, however, being in the different elementary schools."

If all this is not sufficient proof that the greater tax upon the eyes increases near-sightedness, let us follow these young persons as they grow older. Dr. Cohn examined 410 of 964 students at the Breslau University—without selection, however. Among these 410, not *one-third* had normal eyes, and nearly *two-thirds* were short-sighted. His data showed this trouble to be the most frequent affection of the eye among students, and that it increased with the age, and number of terms, of student-life.

Let us see, now, how it is with the *spectacles* of these near-sighted youths, of both sexes, even in the land from which almost all our knowledge of the refraction and accommodation of the human eye comes. Dr. Cohn found only 107 wearing glasses. Of these, only 8 had been ordered by a physician, the other 99 bought by the children on their own selection. Some had changed the glasses prescribed for them by a physician, for stronger ones. Of the 107, only 26 neutralized the near-sightedness, 41 were weaker, 40 stronger than the myopia. Only *eleven* out of the whole number had concave glasses that were not injurious.

Every progressive myopia is threatening with respect to the future. If it continues progressive, the eye will soon, with troublesome symptoms, become less available and, not unfrequently, at the age of fifty or sixty, if not much earlier, the power of vision is irrevocably lost, whether through separation of the retina from the choroid, from effusion of blood, or from atrophy and degeneration of the yellow spot, or the central point of best vision in the retina.

Now, then, our readers understand that there is a disease which affects the back of the eye-ball causing it to bulge, and so produces increasing and dangerous near-sightedness, and that all occupations which try the

eyes help to hurry this forward. The procuring of the Duplex Eye Sight Restorer is of the first importance to ward this off, by frequent exercise in their use, to arrest impending loss of sight, or blindness. Moreover, there are certain visible changes that take place in the back of the eye, which the physician can see by means of his ophthalmoscopic mirror, and he can judge, on examination, whether the near-sightedness is *stationary*, and not dangerous, or *progressive*, and liable to lead, as only too often it does, to partial or total blindness. Here it is interesting to see how Dr. Cohn's investigations completely confirm Prof. Donder's views, above expressed. He examined the relation of myopia to this bulging of the posterior pole of the eye-ball, called by oculists *staphyloma posticum*. Of the one thousand and four myopic children, two hundred had this bulging of the globe behind, readily seen through the ophthalmoscope, the number increasing with the age. The *greater degree* of myopia, the more *frequent* is this peculiar giving way of the eye-ball.

The SEMI-CIRCLE MYOPICS attached to the Duplex Eye Bowls, is an ingenious arrangement made expressly and solely for the cure of near-sightedness. (See fig. 14.) They are lodged inside the Bowls, and so arranged as to accommodate themselves to the form of the eye, while at the same time they operate directly against too great a convexity of the eye, thereby reshaping the cornea so as to bring about the most natural focus without the aid of glasses. After a few applications the sight resumes its youthful clearness, brilliancy, and power, a sure sign that the cure will be permanent.

Another convincing proof of the efficacy of the Patent Duplex Eye Sight Restorer has been discovered, viz.:—that where they have been used regularly, say two or three times a week, the eye-lashes have become re-invigorated. The lines of hair that edge the eyelids have increased in length, strength, and thickness, proving conclusively that our method of exercising the eye is the most suitable (see figures 4 and 5), for preserving or restoring to sight its life, health, beauty, and expression. Addison wrote:

"A BEAUTIFUL EYE makes silence eloquent,
A KIND EYE makes contradiction an assent,
AN ENRAGED EYE makes beauty deformed."

"This little member gives life to every other part about us."

A lady in Chicago writes us: "Since the eye is the medium of the mind, I am more willing to lose \$10.00 than my eyes, so I enclose the money, and I pray you send me a pair of the Duplex Restorers at once."

Suppose you that if Milton were now living he would hesitate one moment about doing the same thing? Only hear his sublime lamentation when blindness had robbed him of half his power:

"Oh, dark, dark, dark! amid the blaze of noon;
Irrevocably dark, total eclipse,
Without the hope of day!
The sun to me is dark
And silent as the moon
When she deserts the night!"

In what happy contrast is the following, received from a school-teacher at Troy, N. Y.: "After two weeks' use of your Duplex Eye Restorers (with the Semi-circle Myopics, for near-sightedness),

"I've bid farewell to my old specs,
And use my naked eyes."

A WORD TO AGENTS.

Agents will be most liberally dealt with. One is wanted in every county not yet disposed of.

Men and women can make more money and do more good at this than at any other employment. For, look: You can, by applying the Duplex Restorer to any pair of Eyes, even if they have been covered twenty or fifty years with spectacles, and found utterly unable to read a word without glasses, produce what is witnessed at this office daily:—make any man or woman see to read with perfect ease the finest print of any newspaper without the aid of glasses, after from one to three minutes' application of the Duplex Eye-Sight Restorer. So, if you can step into any house or store or before an audience, and, as by miracle, produce this astounding result upon two or more well-known persons in the community, you will awaken them on the subject of Sight. By this practical exhibition and test you show them that their Eyes are all right; and, rest assured, they will believe you, too. All that such people want to effect a PERMANENT cure is a few more applications to exercise and strengthen the humors of the Eye while nature conforms the Cornea to the shape of the Duplex Restorer. Now, if the first application enables one to see as clearly as was originally designed by the Creator, to read without the aid of glasses, then the second, and third, and every subsequent application must surely tend to make the eyeballs grow more to that perfect shape; and after this is reached, he or she is PERMANENTLY cured.

Applications are made daily at our office free of charge. We have the very best and only correct instrument ever invented for restoring sight, and we are not ashamed to show it.

Lecturers should have, painted on common muslin, enlarged copies of Figures 2 and 3, etc.; see pages 2 and 3, to show an audience while lecturing. Any painter will make very attractive charts for from six to ten dollars.

Name the State or Territory you wish to canvass, and it will be assigned to you if not already disposed of.

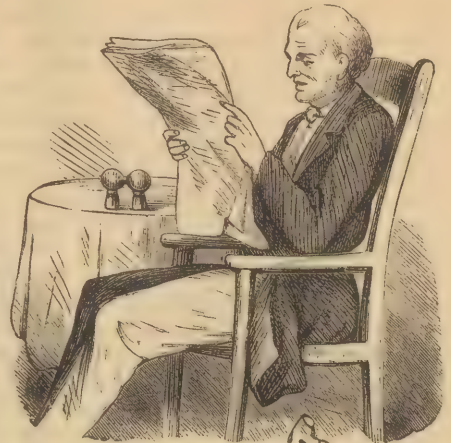
We furnish this book to Agents, with their names printed upon them, at cost price.

To obviate the necessity of too much correspondence, we particularly request all those wishing to become Agents, to carefully read this book, so as to better understand the nature of the business and be able to write us intelligently at once.

There is enough new and interesting matter in this book for many lectures. It can be many times told without growing stale.



BEFORE!



AFTER!



BEFORE!



AFTER!

 CONFIDENTIAL.

ANY one writing us on any subject may depend upon it, that we will hold everything confidential and not give publicity to a name without written permission.

Every high-minded and honorable member of the profession is bound to do this.

We could give thousands of the best of testimonials to the public on cures already effected, but, on honor, we have no right to use them.

The wonderful restorative effects of our Patent Duplex Eye Sight Restorers have elicited many autograph letters from the most noted men and women of education and refinement in Europe and America.



Here is the **TEUTONIC PHILOSOPHER**, pursuing his own particular hobby.

Look at his **ANXIOUS EYES**! his right hand clasped over his mouth, his left tightly clinching his spectacles, ever ready to adjust them along the length of his nose so as to focus the varying matter before him. What work is he studying? Is it some abstruse, theological treatise? some key to the mysteries of alchemy? or the receipt of the "elixir of life?" Faust, of old, you know, studied so when he conjured up his Mephistopheles—that demon who so craftily led the worthy Doctor to perdition.

The Eye-shade, the cast of the features, the position of the pen, and even the disposition of the books behind and the ponderous volume before him, are all set forth with a careful regard to detail; while, at the same time, he is imbued with a humor which is irresistibly comic.

There is nothing out of the way. The sketch brings before us a man reading a book voraciously. His **TROUBLESOME EYES** and "**BOTHERSOME SPECTACLES**," render the effect somewhat ludicrous.

WHEN YOU ORDER, CUT OUT THIS LEAF ON THIS LINE.

Order No.

When you order, please cut out this leaf, fill out the blanks and return it to us in the printed envelope.

Lay the check or money out flat (without folding), lengthwise with this sheet, so as to wrap it up free from observation, by simply turning down the sides all around.

C. STEPHENS,)

165 Broadway,)

Box 840 P. O., NEW YORK.)

Dated 187

Dear Sir:==

Enclosed please find \$..... for..... your

Patent Duplex Eye-Sight Restorers.

Be sure to send me full directions for using.

Forward them by next Mail or Express, to my address prepaid,
as given below.

I saw your advertisement in.....

Yours very respectfully,

Name.....

Post Office Address.....

County.....

State.....

QUESTIONS TO ANSWER.

Are your Eyes naturally weak or strong?.....

Are they small, medium, or large?.....

Do the Eyeballs appear to you to be too long or too short?.....

How long since your Sight began to fail?.....

How long have you worn glasses?.....

Occupation?..... Age?.....

Are you in perfect health?.....

Here state what YOU think ails your Eyes.....

.....

.....

Overtaxed Eyes, when fatigued by too close application, as after reading, writing or sewing, as well as painfully weak, inflamed, or watery eyes, are refreshed and made strong, kept clear and cool all day long by 3 to 5 seconds' use of our Duplex Eye-Sight Restorer or Eye-Exerciser.

They are in no case injurious. To professional men and women, who lose their sight in the pursuit of wisdom; to industrious merchants, farmers and mechanics; to anybody suffering from Loss of Sight or any Disorder of the Eye, we can, in face of the thousands of testimonials already received, guarantee a permanent cure.

A cure is guaranteed, where the directions are followed; if the guarantee fails, the money paid will be promptly refunded.

To strengthen the sight, exercise the eye with

THE PATENT DUPLEX EYE-SIGHT RESTORER,

Patented December 10th, 1867.

Spectacles are a nuisance!

Any one using glasses, or suffering from weak, watery, sore or inflamed eyes should procure the Duplex Restorer.

We take it for granted that we have convinced the most skeptical of the *difference*, on principle and action, between an "*Eye Cup*" and the "*Duplex Eye-Sight Restorer*."

Why talk of going back to first principles? It is an undisputed fact that "*simultaneous*" "*pressure upon both eyes is the only true and correct principle to be applied to the eyes for a permanent cure of impaired or lost sight.*" But who could work out such a theory, and discover the thing to do it with practically? was the question.

The inventor of the "DUPLEX EYE-SIGHT RESTORER" studied to that end for *fifteen long years* until *success* crowned the efforts of one of the most diligent and persevering of men of our times.

After much labor and expense this most wonderful invention has been perfected.

After long practice we have found it to be exactly the thing so long sought for.

IT DOES *act simultaneously on the two eyes, so that the same atmospheric pressure and action are equal, no matter whenever or however used.*

IT WILL RESTORE THE SIGHT!

SPECTACLES ARE RENDERED USELESS!

THE CURE IS MADE PERMANENT!

Like most inventors, after much time and money spent in experimenting, the inventor of the "*Duplex Eye-Sight Restorer*" became poor, and depended upon us for assistance. We took care of him, and supplied his wants while he perfected his invention. We also advanced the necessary capital to place it conspicuously before the people. We feel proud to have labored with and for him, and to have been instrumental in presenting to the spectacled men and women of our day and generation one of the greatest inventions of the age.

Our reward is the knowledge that nearly every one of the many thousands of Duplex Eye-Sight Restorers already sold has renewed the *Inestimable Blessing* of SIGHT to some one's heretofore *sightless eyeballs*.

PRICES.


One pair, made of the purest Para-rubber
and toughest lignum-vitæ bowls.....\$ 6 50

One pair, made of the purest Para-rubber
and finest elephant ivory bowls..... 10 00

One pair semi-circle myopics, accurately fitted to any of the above styles for the CURE OF NEAR-SIGHTEDNESS—ONE DOLLAR EXTRA.

One pair sent by mail or express, if prepaid, anywhere in the United States, 50 cents extra, delivery guaranteed.

[To Canada, Europe, or West Indies, \$1.00 extra,] or C. O. D. to any address.

 *Remit in checks or drafts on any national bank, or Post Office money orders, if possible, and where neither of these can be procured send the money order in a REGISTERED letter. All postmasters are obliged to register when requested to do so, and the system is an absolute protection against loss.*

I will be responsible for all money sent to me by Post Office order, Express, or in my printed envelopes, registered.

The envelope sent you is made expressly for transmitting money, large enough to admit a greenback without folding.

When ordering the Restorers write whether the eyes are two long or too short; or large, medium or small, and what you think ails them.

Please also state whether you are in vigorous health or subject to any ailment. Don't be

afraid to relate in detail any evil the "flesh is heir to;" for it is desirable to bring the BODY into TONE while the blessing of sight is being restored. There will be no charge for advice to any one using the Duplex Restorer; the object is to do the most good for the least money.

Write your full address:—

Name
Post Office address
County
State

Address all letters to—

C. STEPHENS,
165 Broadway,
(Box 840 Post Office.) New York City.

"A blind man is a poor man,
And blind a poor man is;
For the former see'th no man,
And the latter no man sees."

Our sight, like our hearing, is used with so little consciousness, that we do not realize its importance and value until it is impaired or lost.

Not to me returns
Day, or the sweet approach of even or morn,
Or *sight* of vernal bloom or summer's rose,
Or flocks, or herds, or human face divine.

Milton.



THE DUPLEX EYE-SIGHT RESTORERS are sent by mail or express, to any part of the world, without injury. Full directions accompany each pair.

The exhaust ball of the Duplex Eye-Sight Restorer is manufactured from the best and purest Para-rubber. Years of use will not weaken it.

The eye-bowls are made of Lignum-vitæ (Guaiacum) wood and Elephant Ivory. So made to satisfy all tastes.

Economical, common-sense people order the Lignum-vitæ.

Tasty and aristocratic people order the beautiful Ivory.

Oculists, medical men, and institutions for treatment of the eye and ear order the Ivory.

We wish it distinctly understood that the *effect* produced by their use, whether made from the lignum-vitæ or ivory, is all the same. There is no other difference in them than the name. All are made with the utmost care, so that the inestimable blessing of SIGHT may be restored as soon as possible.

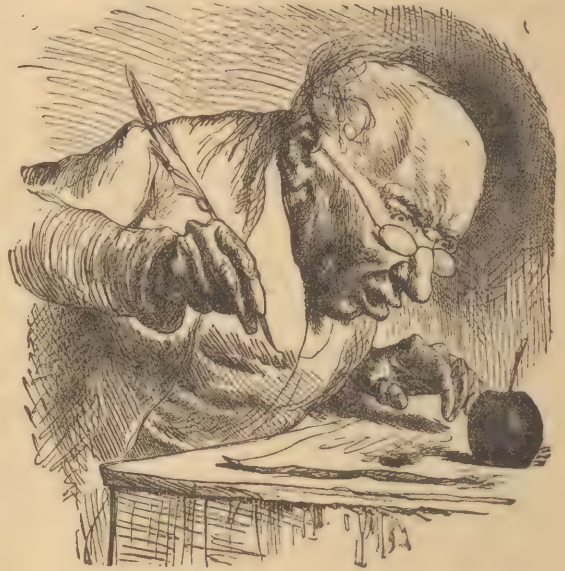


X.

MISFORTUNES OF THE SPECTACLED HUSBAND.

We represent in the first sketch, X, a grave old gentleman: a doctor, who, with a strong prejudice to "all new-fangled notions," prefers the goose-quill of his youth and the old spectacles of his grandmother to anything so universally used as the Duplex Eye-Sight Restorers, or the more convenient forms of gold and steel pens of modern times. He WILL make a GOOSE-QUILL PEN, with his SPECTACLES SET AT THE USUAL DISTANCE.

At first he don't succeed, so he vigorously cuts off the



Z.

bad portion and readjusts his spectacles further down on the tip of his nose.

In the second sketch, Y, he is earnestly splitting and pointing the nib, with a most amusingly anxious cast of countenance.

But in the third sketch, Z, the irritated and yet pitiful expression of his features is most ludicrous—as he finds that all his arduous labors have been in vain, and have only resulted in a—blot.

Our advice to all similarly blinded is to lay aside goose-quill pens and spectacles; purchase the beautiful Duplex Eye-Sight Restorer—get a few steel or gold pens—and then try to live so as to know more about this Golden Age of industry and invention.

From the New York Observer, June 15, 1871.

SPECTACLES.

"Spectacles are worn by so many people now-a-days that we are often inclined to wonder how former generations managed to get on without them before they were invented. The old Greeks and Romans do not seem to have known the luxury; but then, perhaps, their eyes were better than those of the present short-sighted race of mortals.

Many near-sighted persons can see to read better without glasses than with them, but to see distant objects they *require glasses*. All such persons should procure the Duplex Eye-Sight Restorer with the semi-circle attachment. While using the latter, dispense with your glasses for a day or two, and you will have no further desire to use them. Full directions are sent, which, if followed, will effect a cure in from one to three weeks according to the nature of the case and the strictness with which the directions are followed.

The length of time one has been near-sighted does not effect the certainty or permanency of the cure.



Y.

The cure is made so complete as to enable one to do away with any future necessity of using either spectacles or Eye-Sight Restorer.

If, in this progressive age, there be any man, woman, or child, wearing spectacles, or suffering in any manner whatsoever from defective vision, too skeptical to believe in our method of treatment, or too cautious to try what we so fully guarantee, we choose to remind them of the man from Ohio, who, when a Phrenologist told him that his "bump of cautiousness" was "over large," very stupidly busied himself in the cultivation of that faculty, until it became so enormously swelled that he asked "our opinion of a single *Eye Cup*," in the following words:

"I wish to ask you if I might not attempt the restoration of one eye at a time. (Caution is large with me.) I might, however, go one eye on it, and if so, I need only "one cup."

We replied to him the eyes are sympathetic in feeling

and action, and the only true treatment is to exert the same atmospheric pressure simultaneously around and upon the two eyes, by use of the Patent Duplex Eye-Sight Restorer. At the same time we sent him the following extract from a letter received only a day or two before:

"I suppose it is owing to their difference in strength," "and being made single, and applied one to each eye, their" "action is unequal, and they don't operate alike. One" "draws harder than the other, and the suction is not the" "same. I am convinced of this because one of my pupils" "is now larger than the other." (See remarks of Dr. E. B. Foote, page 20, second column.) All single Eye Cups are defective.

A few days after he purchased our invention, and soon restored his sight. In his last letter, the same party asks "if we won't invent some other remedy as simple and effective as the 'Restorers,' most applicable to the cure of the majority of the ills common to the human body."

DR. MOTT'S CATARRH SPECIFIC

IS A

DESICCATED VEGETABLE SNUFF.

The vegetable is found in South America in large quantities, and good to eat. It is gathered, cured and desiccated so as to retain all the natural aromatic taste and smell. It is ground into a beautiful white powder, and put up in packages for medicinal use. It has already proved to many thousands to be Nature's only sovereign remedy for Colds in the head, and all manner of Catarrhal complaints.

It is truly "THE GREAT CATARRH CURER."

It makes the liveliest and most agreeable Snuff imaginable. It does not stand fooling around, but goes straight about its business. It clears the nose, and relieves the head at once, without the slightest distress or pain. A repetition of the dose once a day for one week will effect a satisfactory cure.

Symptoms of Catarrh:

Obstructed breathing, partial closure of one or both nostrils—a "stopped up," "stuffy" feeling in the head—constant blowing of the nose—discharge from the nose of watery, or thick, or yellowish, or greenish mucus. Sometimes the matter becomes hardened, and is removed with difficulty. In the morning, on rising, the symptoms are usually the most unpleasant. There is often a severe fit of hawking and spitting, until a little lump of mucus is dislodged from the back of the throat. There is always more or less expectoration, and fluid dropping down the throat.

In severe cases, the odor is most offensive—causing a horrible bad breath, and the sense of smell becomes impaired. The hearing and eye-sight are often visibly affected.

Finally, the disease extending, the larynx, bronchitis and lungs become involved, terminating in Pulmonary Consumption.

There is also DRY CATARRH, in which there seems to be a partial or total cessation of the secretion of the *Pituitary* and *Salivary Glands*, causing a troublesome dryness of the nostrils and throat, rendering deglutition most difficult, and impairing the voice and sense of taste and smell.

The Exciting Causes of Catarrh are:

Exposure to cold, low diet, foul atmosphere, impure water, scrofula, excessive drinking of fluids, inhalation of fine particles of mineral substances, mercurial salivation, syphilis, and superabundance of acid in the system.

Catarrh can be Cured.

No case of Consumption ever yet existed, but what it commenced at first as a cold in the head—Catarrh.

To attempt the cure of the Pulmonary symptoms, go primarily to the cause—Catarrh!

The results of our investigations upon this subject are a true knowledge and an accurate treatment for this formidable malady.

This remedy is active, penetrating and cleansing, dislodging all morbid secretions from the head, and its membranes, and yet is harmless to the most delicate constitution under all circumstances.

While using it, no change of diet or business is required.

There are multitudes now suffering from symptoms of Catarrh, who have yet no suspicion that it is about to destroy their health.

The following sure indications of the disease are often mistaken for some trivial indisposition—namely: pain in the head above the eyes, and in the temples; frequent sneezing; thick or thin acrid discharge from nostrils; a sensation like "cold in the head;" increased flow of tears, mental dullness, etc.

To the symptoms enumerated more dangerous ones are presently added, such as hacking cough, raising of little, offensive crusts, bronchial sore throat, tonsillitis, etc.

This ignorance of the prevailing effects of Catarrh lulls thousands yearly to a fatal neglect, until Dyspepsia and Consumption steps in and completes the picture.

One-third of the human race have CATARRH. Many children of tender years are troubled with it in some form or other, but are unaware of it. They are troubled with cold in the head most of the year. If cold in the head is not cured at once, Catarrh will result.

DR. MOTT'S DESICCATED VEGETABLE SNUFF will relieve the pressure in the head, caused by a cold, at once, and, in a few days, cure Catarrh in the head entirely.

Price by Mail per Package, - - - - - 50 Cents.

To be had only of

ADDRESS BOX 840, POST OFFICE,

C. STEPHENS,
New York.

FOREWARNED**IS****FOREARMED.****BECOME YOUR OWN PHYSICIAN,**

And that of your Family.

On Land or Sea use the

HYGIENIC MESSENGERS.

Keep the Doctor at bay,

And let Health—

The Mother of Happiness

And the Handmaid of Plenty—

Preside over your Household.

You must always have a something handy

To give at night or by day,

For a Headache,

Sour Stomach,

Cold, Croup, Whooping Cough,

Diarrhoea, Rheumatism,

Costiveness, and other ills

That flesh is heir to!

The Hygienic Vegetable Messengers

Are all made by hand,

And accurately subdivided.

Each Messenger is in a separate cavity,

Preserved in the proper shape,

Secure from contact and injury.

For which the United States Government

Has issued to us **LETTERS-PATENT**,

Dated December 15th, 1868,

Granting us protection

For all and every claim made

For the discovery.

They are pleasing to the eye,

Pleasant to the taste,

Compact, portable, reliable,

Positive in character,

And prompt in their effects.

They digest *properly along with the food*,

Thereby entering into the blood, and imparting to it that energy necessary to rid itself of all impurities, and then drive these impurities, in a pleasant manner, out of the Bowels. That is their nature, and is attested to by every one who has taken them.

We pledge our reputation that they are the best Family Remedy ever prescribed.

We warrant them to keep in any climate.

We warrant them not to vary, change, or deteriorate by age.

General and full directions, particularized for every complaint, come around each box. So simple they require no study! Can be given in an instant! Cause no sickness! and while under their use you may **WORK, WALK, RIDE, STAND, SIT, SLEEP, DRINK** or **EAT** at pleasure.

Sample Boxes, put up under our Patent of December 15, 1868, will be sent by mail or express to any address, free of charges, on receipt of the wholesale price, viz: 50 cents. Address,

C. STEPHENS,

(Box 840, Post Office,) New York.

WE ARE**OF THE****OPINION**That if **YARROW**

Was the only Medicine

Sold at Drug Shops,

There would not be

One quarter of the disease

That there is at the present time.

CONSUMPTION YIELDS TO YARROW!

All forms of disease

Have their origin

In what is termed "**COLD**."

The natural passages become stopped,

And the entire system obstructed;

It must be clear

That any warming, soothing preparation,

That acts in accordance with

The laws of life and motion,

Must be a good and powerful remedy;

Such, in fact, is "**YARROW TROCHES**."**COLICS, CRAMPS, AND PAINS IN THE BOWELS,**

Coughs, Colds, Hoarseness and

Bronchial affections,

And aggravated cases of

Headache, Coryza,

Catarrh and Influenza,

YARROW TROCHES

Will relieve immediately.

They moisten the mucous membranes

Of the head, nose, throat and lungs,

And equalize the circulation.

PRESCRIPTION.**FOR CHILDREN WITH WHOOPING-COUGH,**

Sore throat, aches and pains, and crying:—

Dissolve four Troches

In two tablespoonfuls hot water;

One tablespoonful given every two hours

Will soothe and cure the suffering child.

PRESCRIPTION.**FOR OLD SORES, SCALDED HEAD,**

Chapped hands, or any form of scurvy,

Make an ointment thus:

Take one box of **YARROW TROCHES**,

As much, by weight, of lard,

One tablespoonful ground ivy,

One tablespoonful red pepper,

Over a slow fire mix two hours,

Then strain and cool,

And you have a **YARROW OINTMENT**,

Very cleansing, soft and soothing;

For old and putrid flesh or sores,

Always unctious to the feel,

Preventing dryness of the parts,

Of healing virtues truly marvellous.

ITCH. It WILL cure Itch.**SALT RHEUM. It WILL cure Salt Rheum.**

It WILL cure all eruptions

And all diseases of the Skin,

Swellings, Stiff Joints and

Inflammatory Rheumatism.

Thousands are using **YARROW TROCHES**

Who have testified to their beneficial

Effects on the human system.

We ask you to **TRY IT!****YARROW TROCHES** are the only Troches

Used, prescribed and recommended.

(Address,)

C. STEPHENS,

(Box 840, P. O.,)

NEW YORK.

Every Troche or Lozenge is placed in a separate cavity, secure from contact or injury, put up under Letters Patent, granted by the U. S. Government, dated Dec. 15, 1868.

Sent by mail, to your address, for 35 cents.

ADDRESS

TO THE

NERVOUS AND DEBILITATED,

Whose sufferings have been protracted from hidden causes, and whose cases require prompt treatment to render existence desirable: Do you have spells of short breathing or dyspepsia? Are your bowels constipated? Do you have spells of fainting, or rushes of blood to the head? Is your memory impaired? Is your mind constantly dwelling on this subject? Do you feel dull, listless, moping, tired of company, of life? Do you wish to be left alone, to get away from everybody? Does any little thing make you start or jump? Is your sleep broken or restless? Is the lustre of your eye as brilliant? The bloom on your cheek as bright? Do you enjoy yourself in society as well? Do you pursue your business with the same energy? Do you feel as much confidence in yourself? Are your spirits dull and flagging, given to fits of melancholy? If so, do not lay it to your liver or dyspepsia. Have you restless nights? Your back weak, your knees weak, and have but little appetite? If no treatment is submitted to, Consumption or Insanity must ensue. Your health and happiness, and that of posterity, depends upon prompt use of a reliable remedy.

FLUID EXTRACT, SPANISH SARSAPARILLA,

The Great Blood Purifier and Beautifier of the Complexion,

Spanish Extract Sarsaparilla

Will radically exterminate from the system Scrofula, Syphilis, Fever, Sores, Ulcers, Sore Eyes, Sore Legs, Sore Mouth, Sore Head, Bronchitis, Skin Diseases, Salt Rheum, Cankers, Runnings from the Ear, White Swellings, Tumors, Cancerous Affections, Nodes, Rickets, Glandular Swellings, Night Sweats, Rash, Tetters, Humors of all kinds, Chronic Rheumatism or Dyspepsia, and all diseases that have been established in the system for years.

Being prepared expressly for the above complaints, its Blood Purifying properties are greater than any other preparation of Sarsaparilla. It gives the complexion a clear and healthy color, and restores the patient to a state of health and purity. For purifying the blood, removing all chronic constitutional diseases arising from an impure state of the blood, and the only reliable and effectual known remedy for the cure of Pains and Swellings of the Bones, Ulcerations of the Throat and Legs, Blotches, Pimples on the face, Erysipelas, and all Scaly Eruptions of the Skin, and Beautify the Complexion.

Our Spanish Sarsaparilla (Fluid Extract)

Is put up in SPANISH AMERICA. Made from *selected roots*. Gathered by our agents *on the spot*.

The second quality of roots are bought by manufacturers at a very low price, and this accounts for the poor quality of Fluid Sarsaparilla generally.

We guarantee Spanish Sarsaparilla better than any other ever made, for one quart bottle equals, in strength, one gallon of the syrups or decoctions made by "first-class druggists."

Price only \$1.50 per bottle, four bottles for \$5.00.

YE PIMPLED, BLOTCHED AND ULCERATED VICTIMS

of Scrofulous diseases, who drag your unclean persons in the company of better men, take our SPANISH SARSAPARILLA, and purge out the foul corruption from your blood. Restore your health, and you will not only enjoy life better, but make your company more tolerable to those who must keep it.

The Hygienic Vegetable Messengers are the result of twelve years' experimenting, perfectly safe for, and taken by children. No nausea; no griping pains; but mild, pleasant and safe in operation. Two bottles of the

FLUID EXTRACT OF SPANISH SARSAPARILLA,

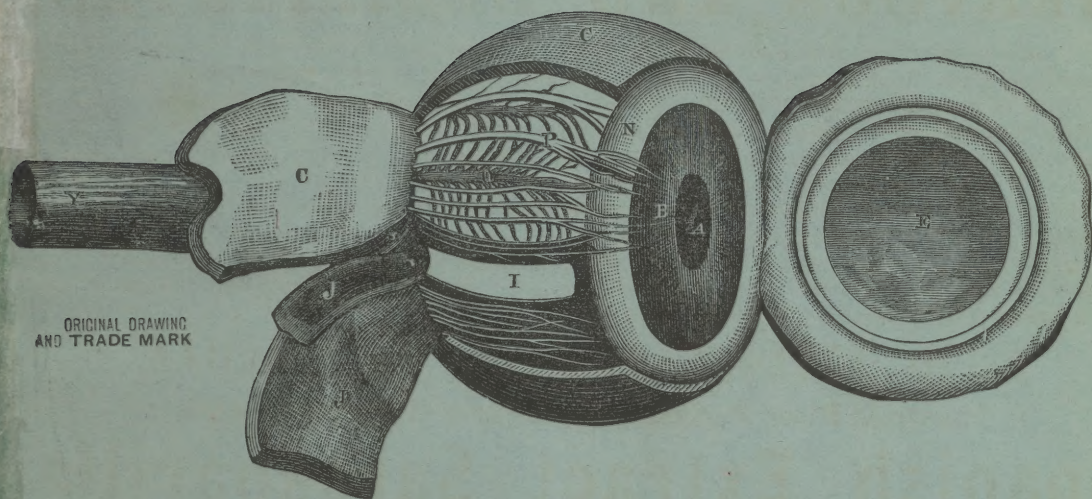
AND ONE BOX OF THE MESSENGERS,

are worth their weight in gold to every living being, especially to those suffering from bad blood, poor complexion, headache, nervousness, wakefulness at night, costiveness and irregularities; and to those suffering from broken and delicate constitutions it will give new blood, new vigor, and new life.

Four bottles of our SPANISH SARSAPARILLA and two boxes of Hygienic Vegetable Messengers will be sent to any address, on receipt of six dollars, or by C. O. D. Address

(Box 840, P. O.,)

C. STEPHENS,
New York.



RESTORE YOUR SIGHT!

SPECTACLES AND SURGICAL OPERATIONS RENDERED USELESS!


THE INESTIMABLE BLESSING OF SIGHT IS MADE PERPETUAL BY A FEW APPLICATIONS OF
THE NEW DUPLEX EYE-SIGHT RESTORER.

Many of our most eminent Physicians, Oculists, Students and Divines have had their sight restored and permanently cured of:

1. Impaired Vision.
2. Presbyopia, or Far-Sightedness.
3. Asthenopia, or Weak Eyes.
4. Epiphory—Running or Watery Eyes.
5. Sore Eyes.
6. Weakness of the Retina, or Optic Nerve.
7. Ophthalmia, or inflammation of the Eye and its appendages.
8. Photophobia, or Intolerance of Light.
9. Photis, or Falling of the Eye Lids.
10. Myodesopia—seeing moving specks or floating bodies before the Eye.
11. Amaurosis, or Obscurity of Vision.
12. Cataract.
13. Partial Blindness, and the Worst Disorders of the Eye.

ANY ONE can use them, according to directions, so as to receive immediate beneficial results, and never more wear spectacles; or, if using now, to lay them aside forever.

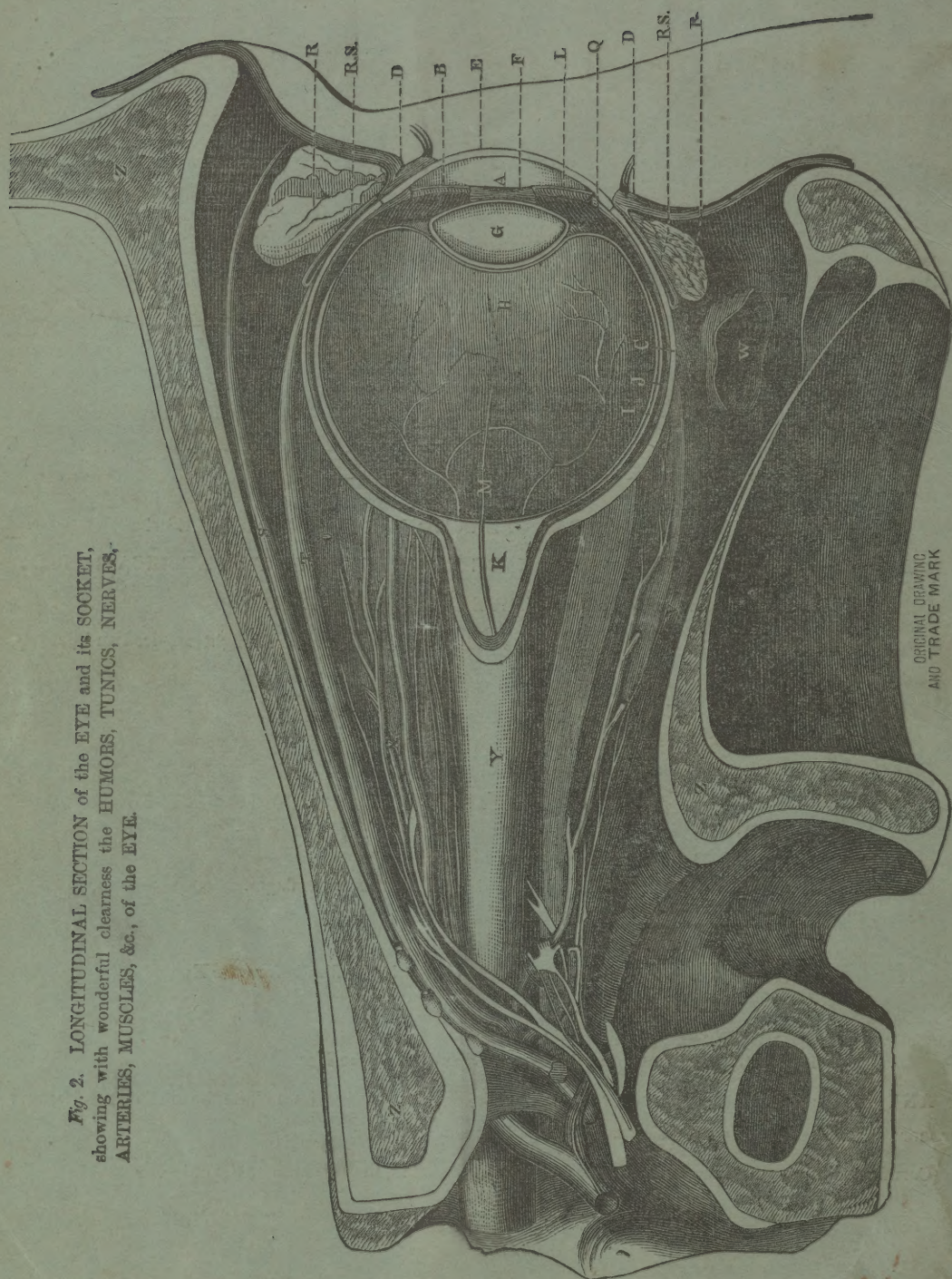
Certificates of cases, where a cure was previously guaranteed, may be seen at the office.

 For the worst cases of MIOPIA, or NEAR-SIGHTEDNESS.

use the

SEMI-CIRCLE MYOPIC ATTACHMENTS, easily adjusted and applied to the
DUPLEX RESTORER.

Fig. 2. LONGITUDINAL SECTION of the EYE and its SOCKET, showing with wonderful clearness the HUMORS, TUNICS, NERVES, ARTERIES, MUSCLES, &c., of the EYE.



ORIGINAL DRAWING
AND TRADE MARK